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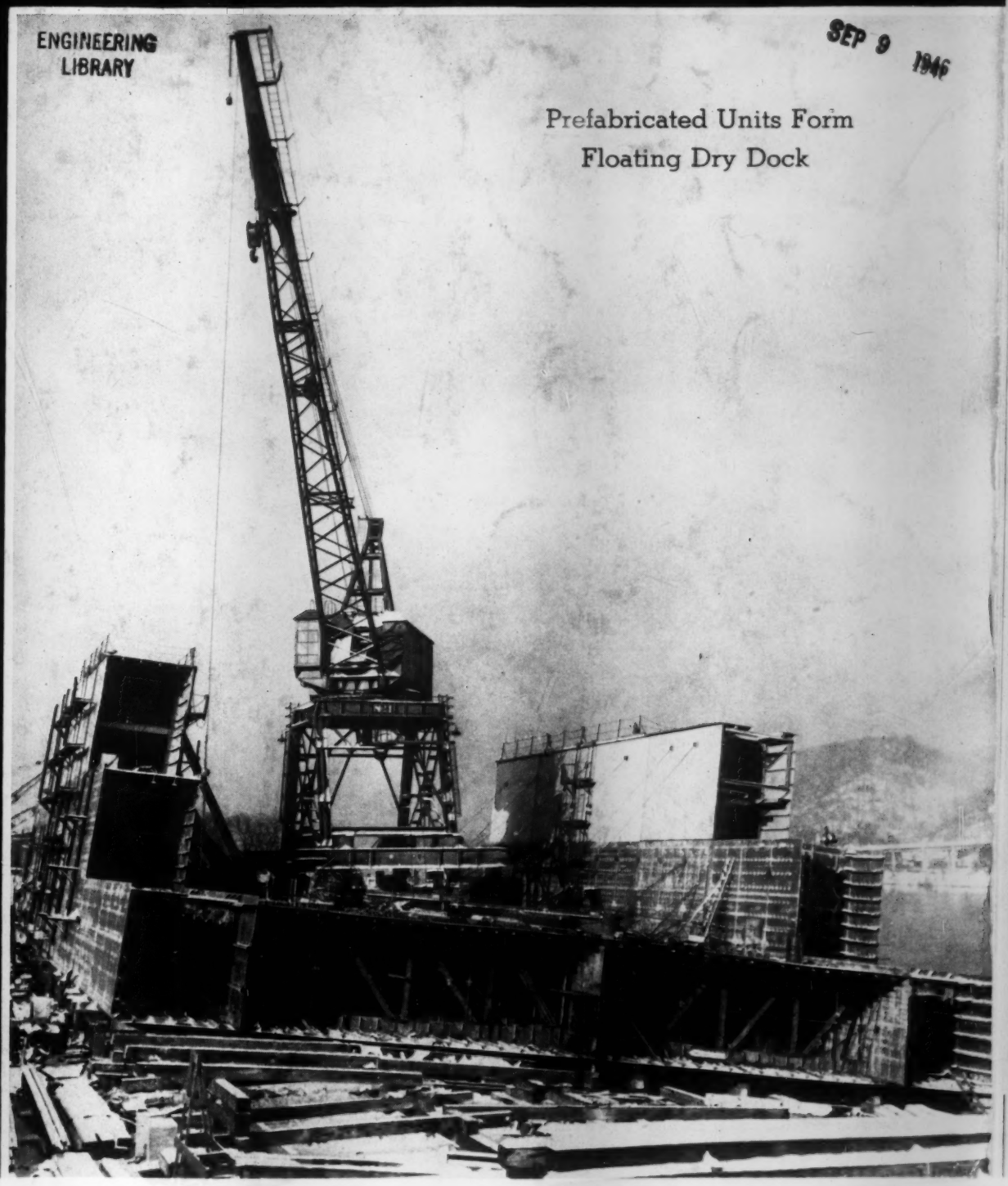

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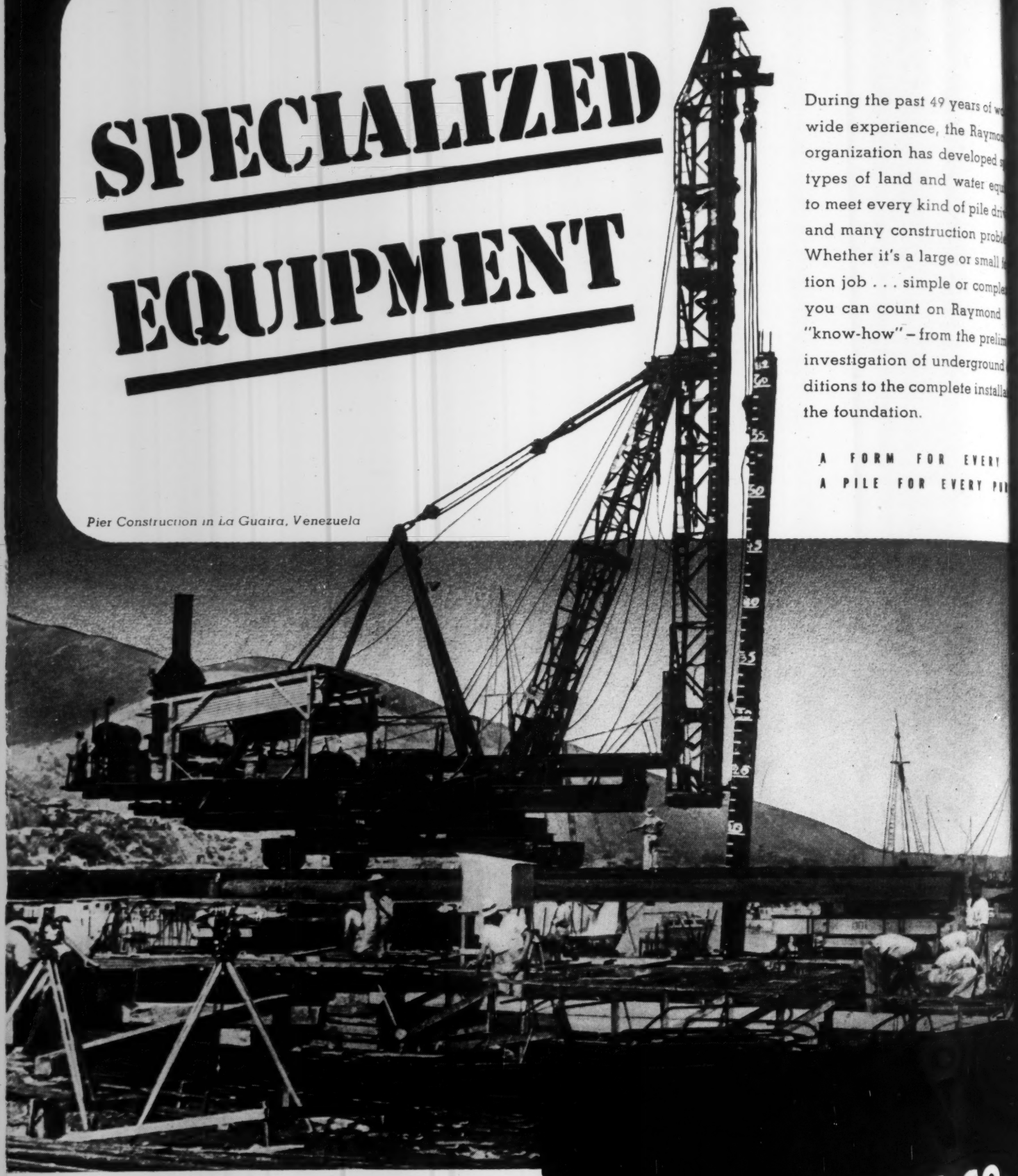

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Among Our Writers

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D. E. CARBERRY (Calif. Inst. of Tech., B.S. '30, M.S. in C.E. '31) was with the Bur. of Reclamation on concrete dam design for nearly 10 years. Since 1941 he has been in the Navy's Civil Engineer Corps as Resident Officer-in-Charge of Construction at the Naval Supply Depot in Oakland, Calif., and as Officer-in-Charge of Construction for the Naval Air Station, Richmond, Fla. Now a Commander, he heads the Aviation Facilities Div., Construction Dept., Bur. of Yards and Docks.

KIRBY SMITH (Annapolis '06; R.P.I. '10) served the Navy on major projects in two wars, and spent a 20-year interlude with the Newport Shipbuilding Co. and Raymond Concrete Pile Co. In 1943 he was made director of the Construction Div., Bur. of Yards and Docks, charged with administering the Navy's vast construction projects in this country, Hawaii, Canal Zone, etc. In 1945 he retired from the Navy with the rank of rear admiral. He then served for 4 months as general deputy administrator-expediter for the National Housing Agency.

CLINTON F. LOYD (U. of Calif. School of Architecture, '25) served in the Navy during World War I. His experience includes 2 years with a San Francisco architectural firm, 7 years as architect with the Westchester County (N.Y.) Park Commission, and 12 years as chief architect for the firm of Madigan-Hyland, of which he is now a member.

JAMES H. ALLEN (M.I.T., B.S. in Sanitary Eng. '22) came to Philadelphia to accept the position of Chief Engineer of the Interstate Commission on the Delaware River Basin in 1937. His previous activities centered in water works, sewerage, and municipal engineering programs in and around Pittsburgh, first with Morris Knowles, Inc., and later as executive to the Chief Engineer of the Allegheny County Authority.

LLOYD M. JOHNSON (U. of Wis., B.S. in M.E. '23) was Engr. of Maintenance and Operation for the Sanitary Dist. of Chicago for 13 years. In 1941 he became Commissioner of Streets and Electricity for the City of Chicago. For the past year he has been serving as chairman of the Engineering Board of Review, and as president of the American Public Works Assoc.

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September 1946

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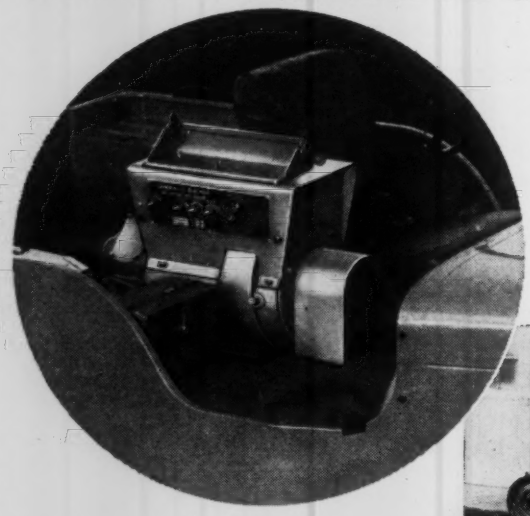

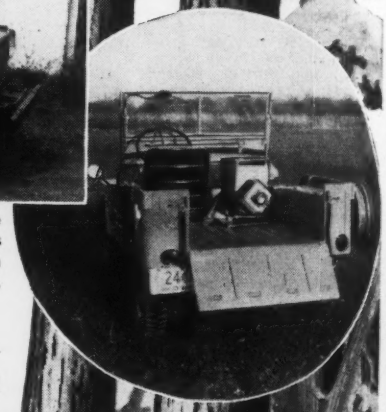

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Volume 16 — September 1946 — Number 9

Kansas City Meeting to Feature First Air Transport Division Session

Fall Meeting—Kansas City, Missouri—October 16–18, 1946

PLANS are rapidly being completed for the Fall Meeting of the Society—scheduled for Kansas City, Mo., October 16–18, 1946—through the activities of the local committee, of which R. N. Bergendoff is chairman.

In addition to a general meeting planned for the forenoon of Wednesday, October 16, there will be a day and a half of the sessions of eight Technical Divisions, devoted largely to engineering problems of the mid-continent area.

The plans call for social events on Wednesday and Thursday evenings, with Friday, October 18, given over to inspection trips to points of interest to engineers, of which there are many in the Kansas City area. Arrangements are also being made for the entertainment of lady visitors during the meeting week.

Preceding the meeting proper, there will be meetings of the Board of Direction on Monday and Tuesday, October 14 and 15. There will also be a Local Section Conference on Monday and Tuesday, consisting of the representatives of some 25 Local Sections. A Student Chapter Conference will be held on Wednesday afternoon and Thursday morning, and it is expected that about 46 Student Chapters will be represented and that there will be a student attendance of between 200 and 300. Special arrangements are being made to house the students.

See the following page for announcements on hotels and rates and a summary program of the meeting.

Passenger Terminal, Kansas City Municipal Airport

COUNTRY CLUB PLAZA DISTRICT

HOTEL ACCOMMODATIONS

The Hotel Continental will be Fall Meeting headquarters but will not be able to accommodate all the visitors. It is anticipated that a large proportion of the visitors will have to be cared for at nearby hotels.

For your convenience in making hotel reservations for the Fall Meeting in Kansas City, October 12–18, 1946, available hotels and their rates are listed below. Use the form at the bottom of the page, indicating your first, second, third, and fourth choice.

Whenever possible, arrangements should be made for occupancy of rooms accommodating two or more persons; only a limited number of rooms are available. All reservations are to be cleared through the Housing Bureau. Members are urged to make their reservations as early as possible.

SCHEDULE OF RATES

HOTEL	FOR ONE PERSON	FOR TWO PERSONS	
		DOUBLE BED	TWIN BEDS
Aladdin	$2.00 to $3.00	$3.00 to $5.00	$4.00 to $6.00
*Ambassador	1.50 to 2.50	2.50 to 3.50	5.00 to 6.00
*Bellerive	3.00 to 5.00	4.50 to 6.00	5.00 to 7.00
Bray	1.50 to 3.00	2.50 to 4.00	4.00 to 6.00
Commonwealth	2.00 to 3.00	3.00 to 5.00	4.00 to 6.00
Continental	2.50 to 4.00	4.00 to 5.00	4.00 to 7.00
Dixon	2.00 to 3.50	3.00 to 4.00	4.00 to 6.00
Fredric	1.50	2.00 to 2.50	
Howard	3.00	4.00	
*La Salle	2.00 to 6.00	3.00 to 8.00	
Muehlebach	3.25 to 7.00	4.50 to 8.00	5.00 to 9.00
Phillips	2.50 to 5.00	4.00 to 8.00	5.00 to 8.00
Pickwick	2.50 to 4.00	3.50 to 6.00	4.00 to 7.00
President	2.50 to 5.00	4.00 to 6.50	5.00 to 7.00
Robert E. Lee	2.00 to 3.00	3.00 to 5.00	4.00 to 6.00
Sexton	1.50 to 2.50	3.00 to 4.00	4.00 to 5.00
State	2.50 to 3.50	3.00 to 5.00	5.00 to 6.00

* Indicates outlying hotels

Mark C. Culbreath, Chairman Housing Bureau, American Society of Civil Engineers
1030 Baltimore Avenue, 3rd floor, Kansas City 6, Missouri

Please reserve the following accommodations for the Kansas City Meeting, October 12–18, 1946:

Single Room.... Room with Double Bed.... Room with Twin Beds....

Rate Preferred: From $..... to $.....

First Choice Hotel———
Second Choice Hotel———
Third Choice Hotel———
Fourth Choice Hotel———

Number in party———
Arrival Date, Oct.——— Time———(A.M.)(P.M.) Departure Date———

Names and addresses of all persons for whom you are requesting reservations. The name of each hotel guest must be listed:

Name——— Address———
Name——— Address———
Name——— Address———

If the hotels of your choice are unable to accept your reservation the Housing Bureau will make as good a reservation as possible elsewhere.

(Signed) ———
(Street Add.)———
(City and State) ———

Summary Program

WEDNESDAY—OCTOBER 16, 1946

MORNING

Meeting called to order by John C. Long, President of Kansas City Section
Address of Welcome
Response by President Horner
Popular Address
Recess
Luncheon, followed by Popular Address

AFTERNOON

Sessions of Technical Divisions

Sanitary Engineering Division
- Sanitary Aspects of the Missouri Valley Development
- Water Supply Problems of Kansas City and St. Louis

Highway Division
- Express Highways as Related to Parkways
- Expansion-Joint Practice in Highway Construction

Air Transport Division
- Airport Planning from the Standpoint of the Commercial Operator
- The Future Development of Air Freight
- The California Bearing Ratio Method of Runway Design and Theoretical Stress Distribution Under Airplane Wheel Loads

EVENING

Dinner and Entertainment

THURSDAY—OCTOBER 17, 1946

Sessions of Technical Divisions—All Day

MORNING

Waterways Division
- Symposium on Regulation of Rivers Prepared by Committee on Regulation and Stabilization of Rivers by Open Channel Work

Structural Division
- Unusual Design Features of Earth Dams

City Planning Division
- Round-Table Discussion on the Major Problems Confronting the Planning of Cities

AFTERNOON

Surveying and Mapping Division
- Program to be announced

Engineering Economics Division
- Program Arranged by Committee on Economic Importance of Ground Water

EVENING

Dinner and Entertainment

FRIDAY—OCTOBER 18, 1946

Inspection Trips to Places of Engineering Interest

FINAL PROGRAM

Complete details of the Convention will appear in the October issue of CIVIL ENGINEERING.

Engineers Focus Attention on EJC

Postwar Program of United Activities Holds Spotlight

THE NEW YORK TIMES, SATURDAY, JUNE 15, 1946.

A NATIONAL RESOURCE

The National Engineers Committee was appointed in February, 1945, by representatives of the five national engineering societies at the request of the then Secretary of State, Mr. Stettinius, to bring the best American engineering thought to bear on the problem of the industrial disarmament of aggressor states. Last September it completed a report on Germany, the recommendations of which were substantially all included in the directive of the Allied Control Council of last March 29 for the limitation and control of German industry. Now its report on Japan has been made public in Washington, with the hearty endorsement of the State, War and Navy Departments, as well as that of General MacArthur. It thus clearly foreshadows long-range American policy toward our defeated enemy in the Pacific.

The basic controls put forward for Japan are at variance with those proposed for Germany. That report based the broad primary control on the allocation of coal, since 85 per cent of Germany's electric power is generated by steam. In Japan, on the other hand, 73 per cent of her electrical energy at the wartime peak came from hydroplants, which were both numerous and widely scattered. This necessitated a different approach to the problem. The engineers committee has recommended the regulation of the mineral and metals industries, the heavy chemical industries, the fuel industry, the electrical power industry and the construction industry, supplemented by the absolute prohibition of scientific research for military application, especially with regard to all forms of nuclear energy.

One of the most striking things about the present report is nowhere to be found in it, able document though it is. This is the availability for national purposes of such organized entities as the engineering profession, whose technical competence is matched by their freedom from any suspicion of political motivation. General Clay has acknowledged that the report on Germany has been his most effective instrument in dealing with both the British and the Russians. The latter, in particular, trust American technologists, whereas they look with suspicion upon our diplomats. Our own Government might do well to utilize even more fully such a national resource.

troubled us, and some of our readers

Possession by Nine Points of Law

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An organization which attained maturity during the war, and in the postwar period bids fair to increase its stature further in enhancing the status of its nearly 100,000 members, is Engineers Joint Council. Already responsible for public recognition of the engineering profession as "a national resource," which is what *The New York Times* recently called the profession following publication of EJC reports on disarmament of Germany and Japan, the organization and its work are receiving the close scrutiny of engineers throughout the country in a greater degree than ever before.

Two developments at the recent ASCE Annual Convention in Spokane served to focus the attention of ASCE members on EJC. These are:

Decision by the **Board of Direction** to continue **"to give full support to a program of Engineers Joint Council for 1946–1947, toward further unification of the activities and aims of the engineering profession at national and local levels"**

Recommendation by **ASCE President W. W. Horner that Local Sections "give considerable of their program time to a better understanding by the membership of the work of EJC," which he termed "probably the greatest and most conspicuous service that the engineers have ever given to the public at large"**

The decision of the Board of Direction was based upon the emphatic recommendations of its representatives on EJC—President Horner, Col. William N. Carey, Executive Secretary, and Past-President John C. Stevens, as well as Past-President Malcolm Pirnie, Mr. Stevens' alternate, who has been very active in EJC affairs. These ASCE men are, of course, familiar with the functioning of EJC.

ORGANIZATION of the numerous branches of engineering into a single body for the consideration and solution of mutual problems long has been the concern of far-sighted engineers. Lengthy discussions, pro and con, on various types of affiliation take up much time at meetings of engineers and much space in professional magazines, indicating a lack of realization that an overall organization, effective in many ways, already exists and is actively engaged in coordinating the efforts of engineers. This brief story of Engineers Joint Council, or "EJC" as it is more briefly called, is told here for the purpose of alleviating, if not eliminating, that lack.

SERVICE RENDERED

What President Horner had in mind in his address to the Local Section Conference luncheon, when he recommended individual study of EJC's work, was that "that organization may seem somewhat remote and impersonal" to many ASCE members.

"This," he said, "is a difficulty inherent in any functioning through federation. Nevertheless, Engineers Joint Council, within the past two years, has been rendering on a national and world-wide basis probably the greatest and most conspicuous service that the engineers have ever given to the public at large. These efforts have been carried forward by the officers of the five great national societies through joint committees, primarily as an additional service of the officers and committee members, and with whatever financial costs involved distributed among the sponsors.

"Therefore, it should be clear that EJC is *your* organization, carried forward by *your* elected officers and *your* executive director, and by many of you members serving on its committees. Its costs are paid in part out of the dues which *you* pay the Society. This expense to date has not been great, but it will increase, and new financing must come into the picture, if this type of service by and for the profession at large is to be continued with still greater intensity."

Engineers Joint Council was not always the going organization it is today, receiving the plaudits of the State, War, and Navy departments, as well as other government officials, for its voluntary contributions toward lasting peace by preparation of reports on how to disarm aggressor nations. In fact, when it first was conceived, it was no more than the meager fulfillment of a recognition of the need for discussion of mutual problems of the principal engineering

societies. It was decided to meet "at least quarterly" to "consider joint efforts in national defense and other matters to improve the solidarity of the engineering profession." That was in 1941, the first formal meeting of what they then called the "Joint Conference Committee" being held in Indianapolis on October 11 of that year.

As organized, the committee consisted of the president and secretary of each of five societies—the American Society of Civil Engineers, the American Institute of Mining and Metallurgical Engineers, the American Society of Mechanical Engineers, the American Institute of Electrical Engineers, and the American Institute of Chemical Engineers. Later, the membership was expanded to include the junior past-presidents of each of the five societies, and in 1945 the name was changed to Engineers Joint Council.

Objectives of EJC are:

To coordinate the policies and activities of engineering societies
To advance professional development by supporting the Engineers Council for Professional Development
To improve the economic status of the engineer
To act on engineering matters of national importance
To promote international engineering relations

In the near future EJC plans to launch a drive to inform every member of all the constituent societies of details of its program. Of particular interest at present are the studies under way by the EJC Committee on Economic Status of the Engineer, which is awaiting replies to a detailed questionnaire sent to each of the nearly 100,000 members of the five societies. An article covering this questionnaire appears on page 385 of this issue.

WORK HAS WIDE SCOPE

Another committee of EJC is examining the organizational structure of the engineering profession. During the past years, numerous groups with mutual interest in specialized fields have broken off from the Founder Societies, forming new organizations with more intensive activity in narrower fields. Obtaining the cooperation of organizations thus formed for the consideration of national, regional, and local problems is the objective of this EJC committee, and recommendations as to the best form of local organizations have been formulated in the committee's efforts to have such organizational work begin at the local level.

Another aspect of the work of EJC through its committees is re-examination of the relationships between employers and employees, which is under way. In the phases of its work concerning the economic status of the engineer, EJC has invited and is receiving the participation and cooperation of the National Society of Professional Engineers.

It can readily be seen that the projects requiring the sponsorship of an organization such as EJC are almost without limit. As an authoritative voice on national legislation affecting engineers, it has already proved its effectiveness. Much more of this and similar work is waiting to be done and, as President Horner advocated at the Local Section Conference in Spokane, it is vital that individual members make a study of the work of EJC, familiarize themselves with that work, and arrive at their own conclusions as to its worth and the degree to which it merits the individual's support.

Western Bargaining Unit Men Form National Group

FIRST steps toward formation of a national federation of professional employees' collective bargaining groups were taken by 25 representatives of 10 such groups at the time of the ASCE Summer Convention in Spokane.

Organizing itself as an independent exploratory committee, the group recommended the name "National Professional Employees Association" for the federation of the autonomous groups now organized, or to be organized, for the purpose of representing engineering employees in negotiating agreements on employment conditions. Next step in the program of these Westerners who took advantage of their joint presence at the Summer Convention to tackle the much-talked-about project of formulating a national federation, will be a convention to be held not later than September 30, at a mutually agreeable location. Each of the interested groups is being asked to elect and send two delegates to this September assembly. Sterling S. Green, chairman of the Southern California Professional Engineers Association, was named chairman of the exploratory committee. Trygve Hoff, chairman of the Seattle Professional Engineering Employees Association, is vice-chairman, and Donald Slawson, secretary of the Engineers Guild of Oregon, is secretary.

In the two-day discussion much favorable opinion was expressed on the subject of providing for bargaining units for subprofessional employees separate from the professional employee's units, following the plan for Technical Employee Affiliates developed by the Southern California Professional Engineers Association. Two such units of Technical Employee Affiliates have been recognized by the National Labor Relations Board as appropriate bargaining units, it was reported at the organization meeting.

In an announcement made following the exploratory conference, Secretary Slawson emphasized that the September convention will not be limited to attendance by those who participated in the Spokane session. He offers to send minutes of the Spokane session to any professional men interested and urges sections not represented at the initial meeting to send delegates to the gathering planned for later this month. Mr. Slawson's address is 2135 N.E. 45th Avenue, Portland, Ore.

The groups represented at the exploratory conference are as follows:

The Arizona Group of Professional Engineering Employees
Southern California Professional Engineers Association
San Francisco Area Group of Professional Employees
Sacramento Group of Professional Engineering Employees
Engineers and Architects Association of Colorado
Engineers Guild of Oregon
Utah Professional Engineers Employee Association
Seattle Professional Engineering Employees Association
Southwest Washington Association of Professional Engineering Employees
Professional Engineering Employees Association of Eastern Washington

Unique Caissons Make Spillway Repairs Possible at Grand Coulee

Work on Buckets at Toe of Dam to Begin in Fall

By ROBERT SAILER, ASSOC. M. ASCE, *and* BRUCE G. DAVIS
ENGINEERS, U.S. BUREAU OF RECLAMATION, DENVER, COLO.

THE task of replacing concrete worn from the spillway bucket of Grand Coulee Dam requires special equipment capable of unwatering large sections at considerable depths. Two tailor-made caissons and a circular drydock are the key elements of this reconstruction program. In this article the construction equipment and procedure are described in detail. It is expected that such repairs will take eight years to complete and will have to be made at intervals throughout the life of the dam because of the enormous amount of energy released by high-water flow over the spillway.

IN the four years since completion of Grand Coulee Dam on the Columbia River, considerable quantities of concrete have been eroded from the spillway bucket by the action of high-water overflow. Although the dam has not been endangered by this anticipated erosion, an extensive program of maintenance and repair is necessary to prevent further erosion. The magnitude of the forces and quantities involved and the unusual design of the spillway bucket removed the problem from the field of routine maintenance and necessitated intensive planning and design. Unusual equipment is being completed to make needed repairs.

The 1,000,000-cu ft per sec overflow spillway at Grand Coulee Dam, if operating at maximum theoretical capacity, would create energy equivalent to 31,800,000 hp at the toe of the dam. While the high-water flow of the Columbia River has never been recorded as high as one-half the ultimate spillway capacity, and normally does not exceed 300,000 cu ft per sec, provision was required in the design to dissipate the destructive force of the falling water. This was accomplished by the construction, at the toe of the spillway, of a circular bucket which causes the spilled water to expend a major part of the contained energy in turbulence (Fig. 1).

At the time the dam was designed, it was anticipated that the release of such enormous amounts of energy would cause eventual erosion of the spillway bucket, and preliminary plans for maintenance of the lower part of the structure were considered along with construction problems. The solution finally determined involves a floating caisson for repair and maintenance of the bucket proper; a face caisson for the sloping surface of the dam above the bucket; a drydock for erection, maintenance, and storage of the bucket caisson; and supplementary positioning, communication, and servicing equipment. All the necessary items are at present in various stages of fabrication or procurement, and it is expected that the entire plant will be ready for operation during the low-water period in the fall of 1946. Complicated and difficult as the problem of maintenance of the spillway at Grand Coulee Dam is, it is felt that with proper coordination of the equipment and methods to be here described, the work can be accomplished satisfactorily.

BUCKET SEVERELY ERODED

To determine the damage to the concrete by the previously mentioned factors, an inspection of the bucket was made by divers during March 1943. Twenty days of arduous and dangerous subaqueous inspection work disclosed that erosion, varying from one inch to several feet in depth, had occurred in limited areas. Boulders and heavy pieces of metal found in the bucket substantiated earlier opinions as to likely abrasive agents.

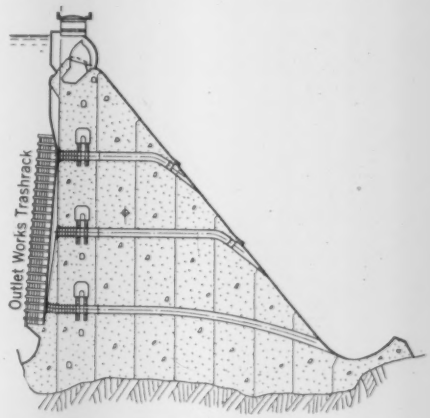
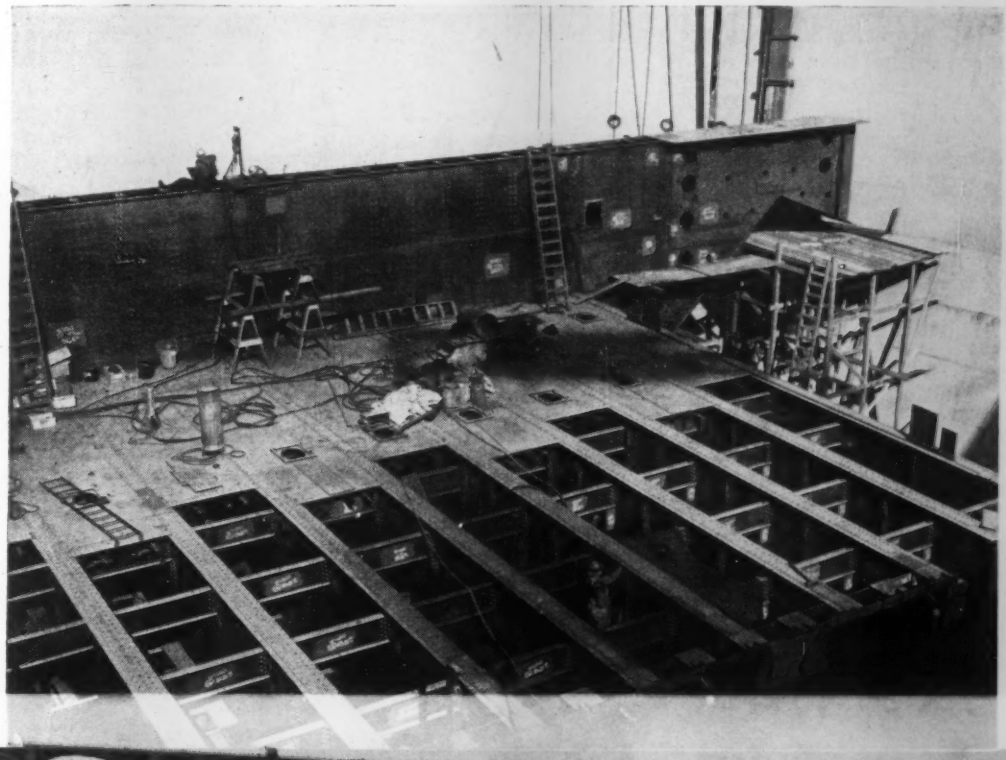


FIG. 1. SECTION OF GRAND COULEE DAM SHOWING SPILLWAY TO BE REPAIRED

A second inspection made during the latter part of 1943 verified the original findings, and also indicated that the rate of erosion had decelerated considerably from that prevailing during the construction period. This condition also confirmed expected results because the flow has been more uniform since the cessation of construction activities, and the installation of the turbines in the left power



ERECTION OF 1,600-TON FLOATING STEEL CAISSON IS NOW IN PROGRESS IN CONCRETE DRYDOCK DOWNSTREAM FROM GRAND COULEE DAM

house has permitted a considerable part of the river to bypass the spillway bucket.

The problem, in brief, consists of unwatering the lower part of the spillway in such a manner that inspection of, and repair to, the concrete may be

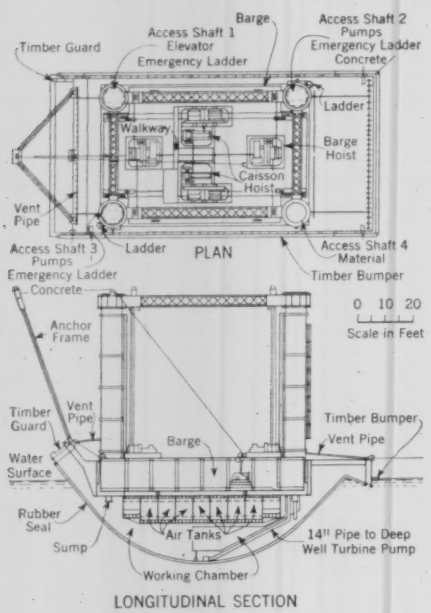


FIG. 2. CAISSON FOR UNWATERING SPILLWAY BUCKET

effected. The area under consideration for maintenance includes the spillway bucket, the low point of which is approximately 70 ft below normal low water, and the sloping downstream face of the dam adjoining the bucket up to a height of 75 ft above the low point of the bucket. The situation is complicated by the fact that discharge over the spillway produces turbulence in the bucket, which must be held to a minimum while the inspection and repair operations are in progress. This automatically limits the repair period to the time of low flow, normally November through March, when the entire flow of the Columbia can be passed through the power-plant turbines of the left power house and the temporary bypass outlets in the right power house. Working under this intermittent schedule, it is estimated that approximately 8 years will be required to complete the repairs to the bucket.

MAJOR EQUIPMENT

As a result of the investigations and model studies, the following major pieces of equipment were selected:

1. A floating caisson to service the curved bucket section from approximately El. 870 at the bottom of the trough to approximately El. 905 on the sloping face of the dam.

2. A floating face caisson to service the dam face between approximately Els. 902 and 945.

3. A concrete drydock for the erection and maintenance of the caissons and for storage of the bucket caisson during periods of high water.

4. A steel work barge, equipped with a revolving crane, to carry air compressors, concrete mixers, excavating equipment, and aggregates, and to perform similar auxiliary services necessary for the repairs.

As finally designed, the floating bucket-caisson is a steel structure, rectangular in plan, 115 ft long by 57 ft wide, provided with air and trim tanks to insure proper flotation for maneuvering and sinking. The caisson is shown in Fig. 2. Built in a well above the air and trim tanks of the caisson proper is a steel barge 73 ft long and 49 ft wide, which carries the machinery for controlling the raising and sinking of the caisson. Four cylindrical steel shafts $7\frac{1}{2}$ ft in diameter and 61 ft high, which are integral parts of the caisson structure, afford access for men and materials to the working chamber and also serve as a guide for vertical movements.

In elevation, the sides of the caisson conform to the shape of the spillway bucket. The caisson rubber seals are attached along the bottom edge of the side and ends to prevent entrance of water into the working chamber after it has been pumped out. As the rubber seals will care for sealing of only the minor irregularities and erosions, it is anticipated that in heavily eroded areas additional sealing by divers will be necessary before the working chamber can be satisfactorily unwatered.

Pumps for the control of water in the trim tanks, leakage in the air tanks, and for unwatering the working chamber and the barge well, are installed in the tops of two of the shafts. Two 3,500-gal per min deep-well pumps serve the working chamber and the barge well, and 500-gal per min and 250-gal per min pumps serve the tanks. Two 25-hp hoists mounted on the barge are cable-connected to the frame on top of the vertical shafts, and two 50-hp hoists are connected to the caisson below the barge. Operation of these hoists controls the relative vertical position of the barge and caisson proper.

Maneuvering equipment for the floating caisson consists of 9 puller machines or winches and a system of sheaves and lines located so as to spot the caissons on the spillway. Three of the pulling machines are to be located on the right power-house gantry platform, and two on the left. Four others are to be located on the banks of the river below the dam.

BUCKET CAISSON PLACED

The floating caisson can be moved to any part of the spillway bucket by proper operation of the pulling lines. Final approach to the face of the dam is made by attaching an auxiliary maneuvering line, operated from the barge and powered by a 30-hp motor, to one of a series of removable anchor castings set on the face of the dam. The 60-ft A-frame at the front end of the barge is then lowered by means of a hoist with a 10-hp motor and fitted to the dam casting. The connection of the A-frame to the dam is made by a universal joint to permit rotation. Two coil springs with a working load of 25,000 lb each are provided in the legs of the A-frame to absorb impact loads caused by turbulence of the water.

During positioning, the operators of the pulling machines will be directed and coordinated from a central control station on the caisson barge. The director of the operation will be in constant contact with the pulling stations by short-wave radio.

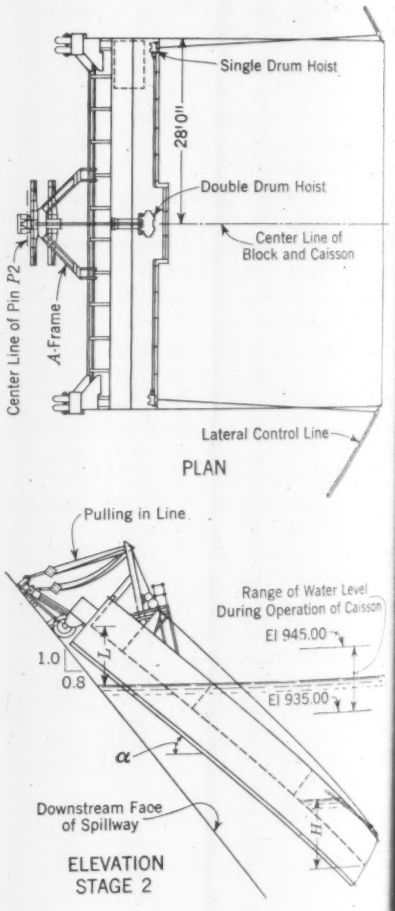


FIG. 3. CAISSON FOR UNWATERING SPILLWAY FACE

SPILLWAY OF GRAND COULEE WITH CIRCULAR DRYDOCK IN FOREGROUND

After the caisson has been moved into position as described, the floating caisson will be lowered by increments using the following procedure. The barge well is flooded to a depth of $7\frac{1}{2}$ ft, then the barge is hoisted 3 ft and more water is added to the well. A series of such operations follows until the top of the barge well is submerged, at which stage the caisson no longer floats and is held in position by the hoist lines of the barge. Both raising and lowering lines are kept taut at all times for stability. After the top of the caisson is submerged, it can be lowered steadily into the bottom of the bucket. When the caisson is seated, the 25-hp hoists lift the barge to the top of the vertical shafts, where it is out of reach of wave action and its weight contributes to the stability of the structure as a whole. To raise the caisson, the procedure is reversed until all water has been pumped from the well and the barge and working chamber are in their initial relative positions.

The face caisson, to service the 0.8 to 1 sloping surface of the dam between El. 902 and 945, as finally designed, is a box 60 ft long and 55 ft wide by 9 ft deep, open on the bottom and one end. (See Fig. 3.) The structure contains an air tank and two levels of ballast tanks for raising and lowering the caisson as well as a trimming tank to aid in leveling. At the upper or open end there are four pneumatic wheels to facilitate movement on the face of the dam and to act as a fulcrum when the caisson is being lowered into working position. An A-frame and pulling-in line, powered by a two-drum air hoist, are mounted on the upper side of the open end. Lateral control is maintained by two four-part, $\frac{5}{16}$-in. control lines, which extend from the upper corners of the low end of the caisson to points on the dam 100 ft right and left of the caisson center-line. A single-drum air hoist on each side of the upper end of the top of the caisson powers the lateral control lines.

In operation, the face caisson will be brought to approximate position by a tugboat. The pulling-in line and the lateral control lines will then be secured to the dam, and the caisson maneuvered into exact position by the appropriate air hoists and a tugboat. Sufficient water will be admitted to the ballast tanks to tilt the caisson part way, and any lateral tipping will be corrected by manipulation of the trimming tank. The A-frame will be lowered and the connection made to the casting in the face of the dam. When this is accomplished, the admission of more water to the ballast tanks will sink the caisson to its working position against the face of the dam. The space under the caisson can then be unwatered and inspection or repairs will proceed. When work in the area covered is completed, the working chamber will be flooded, the ballast tanks pumped out to raise the caisson, the caisson moved to a new position, and the cycle repeated as previously described.

NOVEL DRYDOCK CONSTRUCTED

The necessity for a suitable location in which to erect, maintain, and store the bucket caisson led to the construction of a drydock on the right bank of the Columbia River approximately 1,200 ft downstream from the Grand Coulee Dam. The structure is unusual not only as to location but also in shape and in method of construction. Circular in plan, with an outside diameter of 163 ft and a wall thickness varying from 16 ft at the bottom to 5 ft at the top, the drydock is 55 ft deep and has a 64-ft opening equipped with heavy steel miter gates. (See Fig. 4.) Four reinforced-concrete columns in the center of the dock form a support for the bucket caisson and can also support the face caisson during maintenance operations.

Because subsurface explorations and experience with local earth conditions indicated that the overburden at the drydock site would not stand in open-pit excavation, it was decided to sink the structure to bedrock by open-caisson methods. The first step of the circular concrete shell, provided with a plate-steel cutting edge,

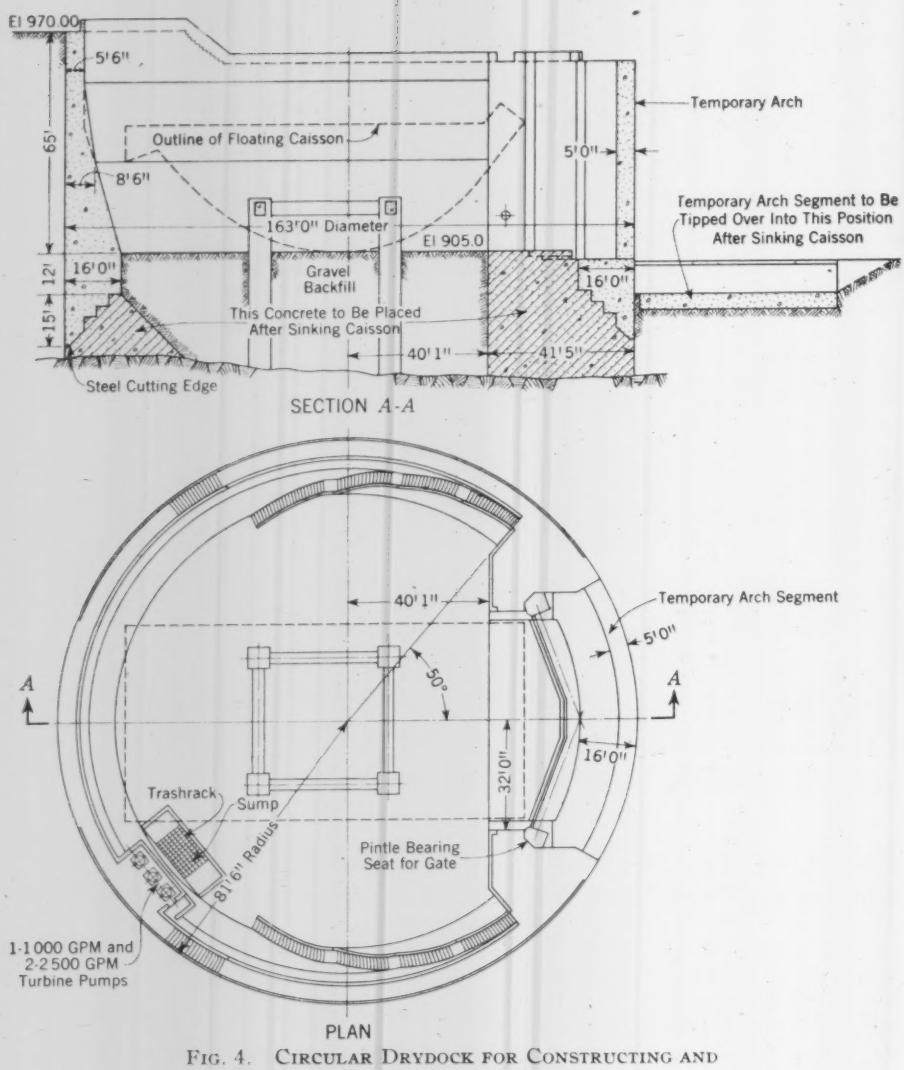


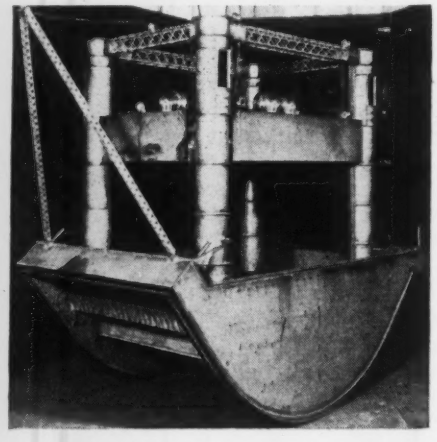
FIG. 4. CIRCULAR DRYDOCK FOR CONSTRUCTING AND MAINTAINING REPAIR CAISSONS

was erected on the leveled site. Excavation within the caisson with clamshell and orange-peel buckets handled by derricks was aided by a bulldozer, which moved material within the reach of the excavators. Placing of concrete in the walls continued as the cutting edge was lowered by removal of the supporting material.

CAISSON SEATED ON BEDROCK

Drilling before the start of construction indicated the extreme roughness of the bedrock but did not locate the highest points or all the ravines that crossed the area. As the lower edge of the caisson moved to its final position, it was necessary to remove approximately 2 ft of solid rock at several points. When the cutting edge had reached the final elevation it was temporarily supported by seven underpinning piers previously sunk to bedrock. The remaining overburden was then removed and the permanent foundation structure and drydock floor were placed. Installation of mechanical equipment such as pumps, miter gates, and their appurtenances followed.

The drydock will be connected to the river by a dredged access channel.



MODEL (1:20) OF FLOATING CAISSON USED TO STUDY CHARACTERISTICS DURING FLOATING, SINKING, AND RAISING

When the channel is completed and all necessary work done in the drydock proper, an 80-ft section of the concrete caisson will be caused to fall outward into the access channel. This will expose the miter gates and the dock will then be ready for operation.

The extremely high flow of the Columbia River during the spring and summer flood season necessitates the use of the overflow spillway. The resulting turbulence, and the rise in river elevation below the dam (as much as 40 to 50 ft), eliminate the possibility of normal anchorage for the bucket caisson. Therefore it is planned to move this caisson to the drydock at the close of the low-water period, normally about March or April, place it on the supporting structure, and remove all electrical and mechanical equipment that would be injured by inundation. This equipment will be serviced during the spring and summer and replaced on the caisson and barge when high water subsides in the fall.

PROGRESS OF THE WORK

The first physical operation in connection with the spillway bucket, aside from purely investigative work, was the start of excavation for the caisson drydock in the fall of 1943. Since that time designs have been completed, specifications prepared, and contracts let for both the bucket and face caissons and their appurtenances. Excavation and concrete work for the drydock are practically completed, the miter gates are being erected, and dredging for the access channel is well advanced. Fabricated steel for the bucket caisson is being delivered at the dam site and assembled by U.S. Government forces. This structure will be ready for operation during the 1946–1947 low-water season. The face caisson is now in process of fabrication and will be delivered to the dam site for erection in the fall of 1946. Puller machines, communications apparatus, and other supplementary equipment are in preparation and will be installed in the summer of 1946.

The construction work at Grand Coulee Dam is being done by U.S. Bureau of Reclamation forces under the direction of Supervising Engineer F. A. Banks, Assoc. M. ASCE. The project is in charge of Regional Director R. J. Newell, M. ASCE. The design and model studies were done in the office of Chief Engineer Walker R. Young, M. ASCE. Michael Straus, Commissioner, is in charge of all activities of the Bureau of Reclamation.

Engineers Joint Council Begins Survey on Economic Status

MR. ENGINEER, don't fail to answer this questionnaire, which should be reaching you in the mail any day now—if you haven't already received it. It is not "just another government questionnaire." It is a study being made by YOUR Society and paid for in part by YOUR dues. The questionnaire comes to you from the U.S. Department of Labor's Bureau of Labor Statistics, because that Bureau, which is equipped to conduct and tabulate the findings of such coded surveys, is cooperating with the American Society of Civil Engineers and other engineering societies in the task of evaluating the economic status of the engineer.

THE 1946 SURVEY OF THE ENGINEERING PROFESSION

Committee On The Economic Status Of The Engineer ENGINEERS JOINT COUNCIL

Cooperative Project In Cooperation With The

Bureau Of Labor Statistics U.S. DEPARTMENT OF LABOR Washington 25, D. C.

NOTE 1: *Questions 2 to 6 inclusive require merely that you circle one and only one of the code numbers.*

1. AGE LAST BIRTHDAY *(in years)* _____

2. SEX: Male. . . . . 1 Female. 2
(Circle one and only one of these two code numbers)

3. YEAR OF ENTERING PROFESSION: Indicate below the year in which you drew your first salary in your professional field.

1899 *(or before)* - 00

19 -	00	01	02	03	04	05	06	07	08	09
	10	11	12	13	14	15	16	17	18	19
	20	21	22	23	24	25	26	27	28	29
	30	31	32	33	34	35	36	37	38	39
	40	41	42	43	44	45	46			

(Circle one and only one of these forty-eight code numbers)

4. FORMAL EDUCATION IN A NON-ENGINEERING FIELD: If you received education in a non-engineering field indicate below the highest educational level reached by you *(excluding honorary degrees)*.

Doctor. . . . . 1 Master. 2

Bachelor. . . . . 3 Incomplete College 4

(Circle one and only one of these four code numbers)

5. FORMAL EDUCATION IN A BASIC ENGINEERING FIELD: Indicate below the highest educational level reached by you in a basic engineering field *(excluding honorary degrees)*.

Basic engineering field	Educational Level: ctor	Master	Bach-	Incomplete ollege	No college no '

IN a self-analysis of unprecedented magnitude, America's engineering profession, in cooperation with the U.S. Department of Labor's Bureau of Labor Statistics, is conducting a survey on the economic status of the nearly 100,000 members of the societies comprising Engineers Joint Council—the American Society of Civil Engineers, the American Institute of Mining and Metallurgical Engineers, the American Society of Mechanical Engineers, the American Institute of Electrical Engineers, and the American Institute of Chemical Engineers. The survey also includes the National Society of Professional Engineers, which is participating.

An up-to-date foundation for evaluating the educational needs and professional opportunities of the engineering profession is the objective of the survey, which is under way after more than a year of preparation and study. The undertaking is sponsored by the Engineers Joint Council's Engineer Survey Committee—a subcommittee of the EJC Committee on the Economic Status of the Engineer. Col. William N. Carey, Executive Secretary of ASCE, is chairman.

The physical conduct of the survey is being handled by the Bureau of Labor Statistics, which is equipped to take care of this type of pre-coded questionnaire, in which participants remain anonymous. The Committee has engaged as consultant in liaison with the Bureau, Andrew Fraser, of Washington, D.C., who prepared a comprehensive report on a similar survey made by the Bureau in 1935.

Calling for information which can be supplied readily and simply, the questionnaire is being mailed to each member of the participating engineering bodies, together with an explanatory letter signed by Ewan Clague, Commissioner of Labor Statistics. Replies will be tabulated by code on machines in the Bureau, which are especially designed for such work.

Emphasis is placed on the need for complete and correct responses to the questionnaire, since anonymity makes checking impossible, and incompleteness, even of one question, automatically excludes all other data in the question from tabulation.

A deadline for receipt of completed questionnaires has been set for November 15, after which Mr. Fraser will proceed with preparation of a report based on the replies.

This is a survey by engineers, for engineers, and about engineers, so each member of the participating organizations is requested to give the matter immediate attention.

The questionnaire is accompanied by an addressed envelope for the convenience of recipients. Let's use those envelopes.

Answer the questions. Answer them completely. And please do it as soon as you receive the questionnaire.

Unusual Floating Drydock Combines Steel and Wood

By J. STUART CRANDALL, M. ASCE
PRESIDENT, CRANDALL DRY DOCK ENGINEERS, CAMBRIDGE, MASS.

TO accommodate cutters of the U.S. Coast Guard, a floating drydock of new design was constructed at the Curtis Bay, Maryland, Yard. The dock, of 3,000-ton capacity, marks the first instance of the use of all-welded steel wing walls on wood pontoons in constructing a longitudinally trussed sectional dock. Other new features include elimination of diagonal bracing in the wing structure, improved control of pumping, and the use of articulated slippers to moor the floating dock to the adjacent pier.

FLOATING DOCK HAS 3,000-TON CAPACITY

LONGITUDINALLY trussed floating drydocks have the simple self-docking feature of sectional docks, but instead of having the sections loosely joined by locking logs which provide no resistance in shear or moment, they are rigidly connected together by means of pins through steel castings at the top of the wings and bottom of the pontoons, forming the several sections into one unit. In this case, the dock consists of five sections, with a total rated lifting capacity of 3,000 long tons at 1-ft freeboard, and the following principal dimensions:

Length over pontoons and keel blocks	300 ft
Length over fantail	350 ft
Width overall	84 ft
Width, clear	64 ft
Depth of water over keel blocks	20 ft

LESS MAINTENANCE WITH WOOD PONTOONS

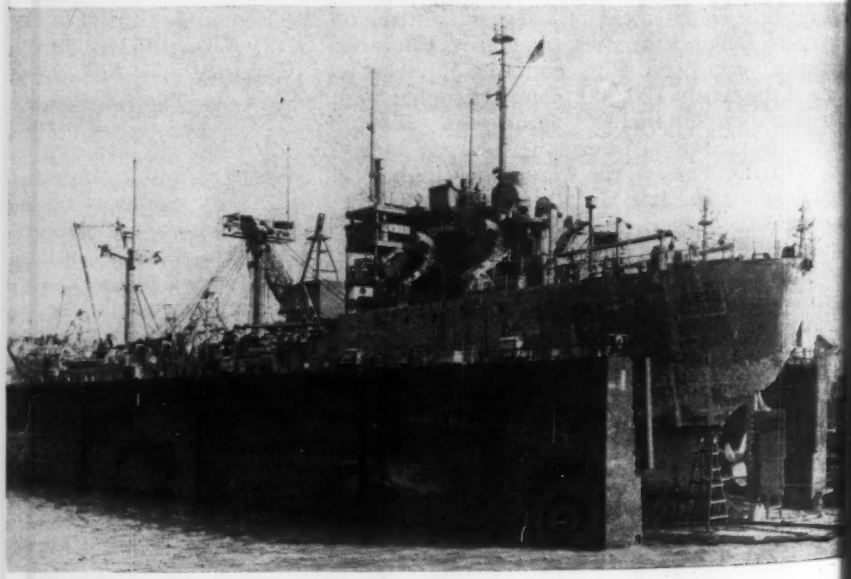
The combination of wood and steel was selected for two reasons. First, wood pontoons have demonstrated that they have a much longer life than those of steel and require less maintenance. Second, steel wings eliminate the recalking frequently necessary with wood planking, and being above water they are readily accessible for cleaning and painting. The exterior surface of the pontoons is sheathed to provide protection against marine borers.

The pontoons are of rectangular cross section, except for the deck camber, to simplify construction and to permit the pump suctions to be located under the wings, thus avoiding long suction lines. They are constructed of long-leaf yellow pine. The concentrated load along the keel is distributed uniformly across the width of the dock by means of transverse trusses carefully analyzed to economize materials and minimize hand fitting. These trusses consist of wood top chords, bottom chords and diagonals, and steel tie-rods for the vertical tension members. Each pontoon is divided into four watertight compartments by two central bulkheads, one longitudinal and one transverse. In addition, each watertight compartment is further divided by means of three longitudinal wash bulkheads. The transverse bulkheads and the central longitudinal bulkheads are designed as girders to resist the imposed positive and negative bending moments. Exterior planking and watertight bulkheads are all calked with white pine wedges.

ALL-WELDED WINGS

The design of the wing walls is unique. Each unit is all welded, transverse strength being obtained by the use of bulkheads in rigid frames, which eliminate al diagonal bracing. In the upper part of each wing, there is a watertight safety deck on which the pump motors and control equipment are located. To provide longitudinal strength and form the five sections into a continuous structure, panels of a Warren-type truss are welded into the structure of each wing, these having an effective chord depth of about 3[illegible] ft, nearly the total height of the wing and pontoons.

The top chord and diagonal members of these trusses are rolled steel shapes, while the bottom chords consist of timber compression members and steel tension members, the latter pre-stressed to reduce elastic deformation and truss deflection. These trusses terminate in steel castings at the panel points, with lugs which mate with those of the corresponding sections for connection by the steel pins already mentioned. To detach any section, it is only necessary to remove eight pins, after which it may be turned through 90° and drydocked on the remaining sections. These trusses are designed to give ample re



FIVE SECTIONS PINNED TOGETHER FORM RIGID DOCK

sistance in moment and shear for the unequal loading which is inevitable in drydocking and to minimize deflection of dock and vessel. For instance, a capacity vessel may be lifted which bears on only four of the five sections, the trusses acting to transfer the required buoyancy from unloaded portions to loaded ones.

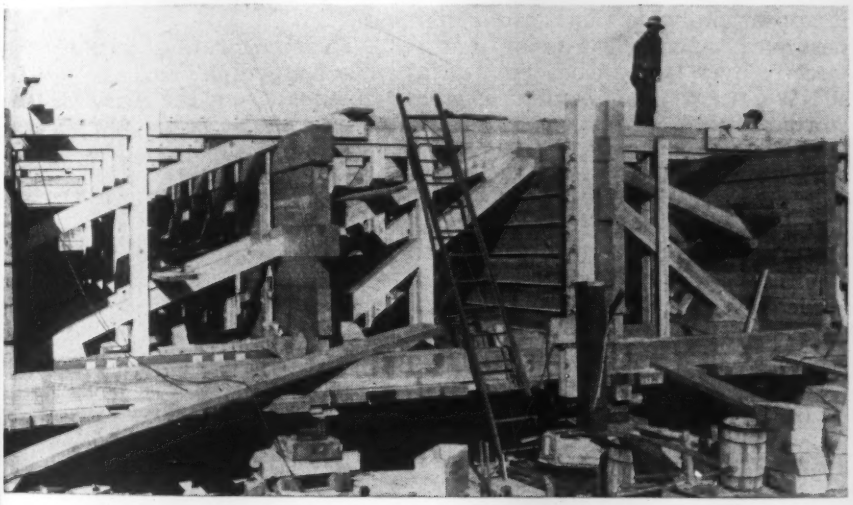
PUMP SYSTEM AND VALVE OPERATION

Pumping equipment consists of twenty 10-in. Peerless axial-flow pumps, one to each watertight compartment, direct-connected to vertical electric motors located along the motor deck, of sufficient capacity to drydock a capacity load in 45 minutes. The control of these pumps is centralized in a control house ashore at the head of the dock. Above the control switch for each pump there is a water-level indicator of the Pneumercator type, giving the depth of water in the corresponding compartment. By this means, a single operator may control the water levels in all the compartments as desired.

Each pump discharges through an interior gate valve and an exterior flap valve. The gate valves are opened at the start of each operation and then closed after the operation is completed. The dock is flooded through square sluice gates in the sides of the pontoons, one to each watertight compartment; these are of adequate size to sink to full draft in about 15 minutes. There is an emergency sluice gate through the central transverse bulkhead under each wing, connecting the adjoining compartments fore and aft, for use in case a pump should fail to function. By opening the emergency gate, the pump in the adjoining compartment can unwater both compartments. Operation of sluice gates and valves, being infrequent, is performed manually, the variation of internal water levels being controlled by the operator in the control house.

The value of the emergency sluice gates and the water-level indicators was dramatically demonstrated during the first operation of the dock. Some minutes after the pumping had started, it was noted that the water level in compartment No. 10, starboard, was not dropping, indicating defective operation of that pump. The emergency sluice gate to the adjoining compartment was opened, permitting pump No. 9, starboard, to pump both compartments. After the docking operation was completed, examination of the pump in compartment No. 10 disclosed a suit of overalls wrapped around the impeller!

STEEL WINGS WERE ERECTED ON COMPLETED PONTOONS



SECTION OF WOOD PONTOON DURING CONSTRUCTION DISCLOSES TRUSSES AND BULKHEADS

There are 32 sliding bilge blocks of the releasing type, moving on transverse slides, operated by galvanized chain and hand winches located along the wing deck. On this wing deck are located one electric capstan and seven hand-operated capstans, together with adequate bollards and cleats for snubbing and fastening lines. A loud-speaker system provides communication between the control house and the wing decks.

The floating dock is moored to the adjacent pier by means of three guides consisting of vertical H-beams fastened to the floating dock and brackets bolted to the pier structure with a hinged slipper which engages the flanges of the H-beams, providing scope for listing and trimming the floating dock as may be required.

Pontoons were assembled in a horizontal position. The bottom chords of the longitudinal trusses were installed, the tension members prestressed, and all exterior outlets, valves, and fittings installed. After each pontoon was launched, it was warped to an adjacent pier, where the steel wings were erected and the pumping machinery and electrical wiring installed. As the sections were completed, they were towed to Curtis Bay, where they were finally assembled.

This floating drydock was constructed and installed under the direction of Commodore LeRoy Reinburg, Commandant of the Coast Guard Yard. The general contractor for the construction was the Tuller Construction Company, of Red Bank, N.J., and the Bethlehem Steel Company, subcontractor for the steel wings. The author acted as consulting engineer to the Coast Guard for the design and supervision.

Timber Hangar's Collapse in Florida Hurricane Investigated

Winds Far Exceeded Design Velocities

By D. E. CARBERRY, Assoc. M. ASCE

COMMANDER, CEC, U.S. NAVY, HEAD OF AVIATION DIVISION, BUREAU OF YARDS AND DOCKS, NAVY DEPARTMENT, WASHINGTON, D.C.

WINDS reaching 160 miles an hour flattened the Navy's timber blimp hangars at Richmond, Fla. These huge structures, the largest ever built of timber, had been painstakingly designed for all probable loadings—the hurricane proved to be the improbable. Emphasized by the official investigation of a Naval Court of Inquiry, was the necessity of assuming "calculated risks" in the design of war emergency structures. This article discusses the Court's findings and represents the official view of the Bureau of Yards and Docks, Navy Department, which designed the hangars and supervised their construction.

WHEN three of the Navy's blimp hangars, the largest timber structures ever built, were collapsed by a hurricane and consumed by fire in September 1945 at Richmond, Fla., a Naval Court of Inquiry conducted an investigation into the cause of the structures' failure. Immediately following the disaster, the writer and other Civil Engineer Corps officers from the Bureau of Yards and Docks were ordered to the Naval Air Station at Richmond to gather facts first hand and to aid the Court of Inquiry. The investigation established, beyond any doubt, that the hangars more than withstood the wind velocities for which they were designed. The design, which called for resistance to 110-mile per hr winds, was a "calculated risk" the Navy had to take to gain wartime material economies. The facts that led to these conclusions follow.

PATH OF STORM PLOTTED

Figure 1 is a location and plot plan of the Naval Air Station at Richmond with relation to the track of the storm on September 15, 1945. The storm originated in the North Atlantic Ocean near the Tropic of Cancer, north of the Lesser Antilles, and was first observed about noon on September 12. It proceeded on a general westerly course, and not until 3:30 p.m. of Saturday, September 15, did it appear probable the storm would pass over Richmond. Passing almost directly over Homestead, Fla., on a WNW track, the center of the storm at its nearest point from Richmond was about $6^1/_2$ nautical miles. At Miami, 20 miles from the storm center, a maximum velocity of 100 miles per hr was recorded. The storm also had passed over Carysford Reef Light weather station, which recorded a velocity of 127 miles per hr. The hurricane progressed at an average rate of 16 miles per hr and, being in the Northern Hemisphere, rotated counterclockwise.

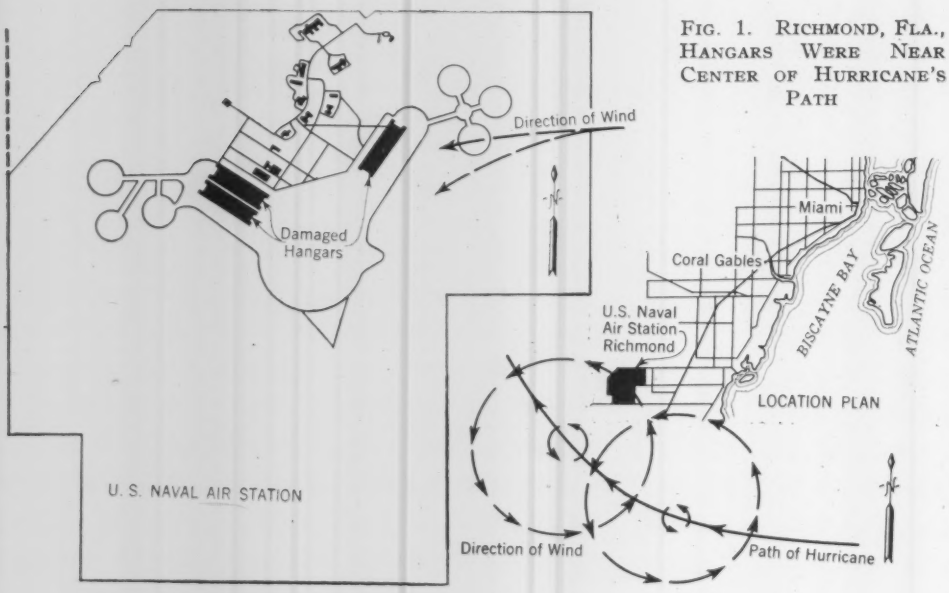


FIG. 1. RICHMOND, FLA., HANGARS WERE NEAR CENTER OF HURRICANE'S PATH

GUST VELOCITY CALCULATED

Although the Selsyn recorder at Richmond had only a maximum rated capacity of 80 knots, the correlation of information gathered from previous minor storms, together with averages recorded on this instrument, made it possible to calculate the maximum gust velocity on the hangars as 160 miles per hr. Moreover, aerologists in Miami who have specialized in the study of tropical storms determined that the station at Richmond suffered the worst gusts on the Florida mainland; these reached about 140 knots, or 161 miles per hr, between 5 and 6 p.m. on September 16.

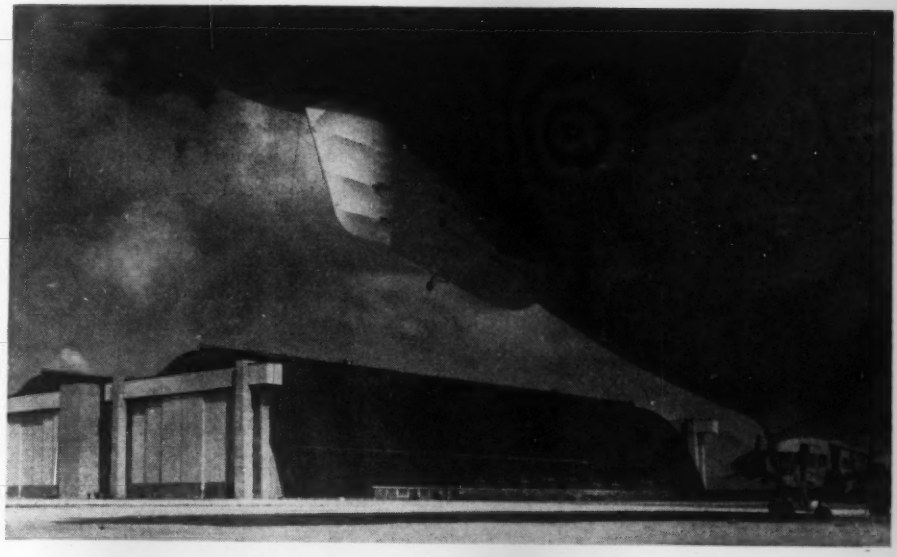
Their calculations were based on microbarograph readings (pressure vs. time) from the Army Air Force Station at Homestead and from the recorded rate of movement of the storm. From these data the pressure gradient was estimated, and from the pressure gradient and the radius of curvature of the isobars, the gradient wind was calculated. Gradient wind assumes no ground friction, so in this case the surface wind was estimated at from 110 to 117 knots. Inasmuch as gusts are assumed to be 15 to 20% in excess of the normal surface velocity, the maximum velocity of the gusts was calculated at 140 knots.

As a further check on the 160-mile per hr velocity arrived at by the foregoing methods, the pressure that would cause the permanent set evidenced in all the steel door frames was calculated. Without regard for probabilities in such matters, this was calculated at 160 miles per hr.

The central lull for this storm was six nautical miles in radius. The Richmond station was $6^1/_2$ miles distant from the storm's eye and on the side of optimum velocity. Therefore the station suffered the maximum gusts contained in the storm. The average wind velocity at Richmond sank to about 40 knots for a 10- or 15-min period shortly after 6 p.m., after which near maximum velocities

were again encountered. By midnight the storm had tapered, and the next morning it had completely abated.

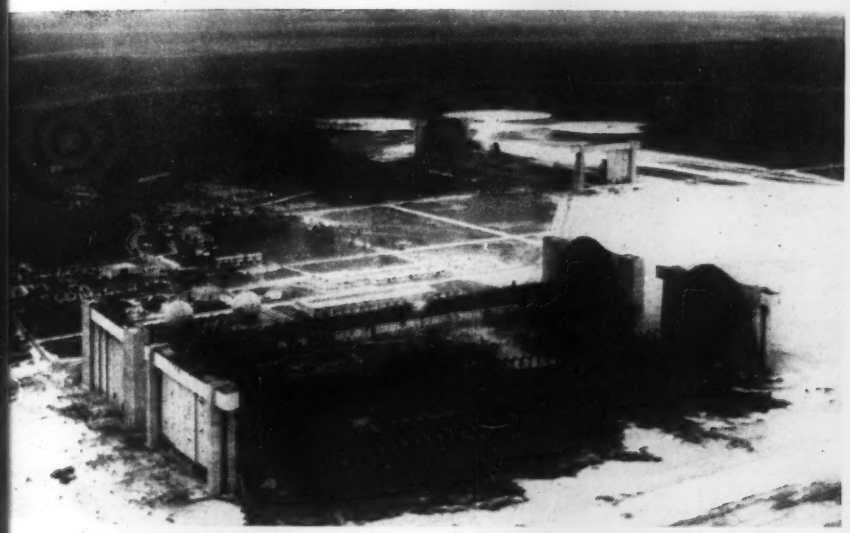
Although it was not a factor in arriving at conclusions of what effects the storm had upon structures, it is worthy of note that competent authorities have acknowledged the possibility that a tornado, superimposed upon the hurricane, occurred in the hangar area. This tornado effect has been noted in other tropical storms, and evidence of the presence of this phenomenon is seen in the fact that a trailer camp, located only ¾ mile from Hangar No. 3, sustained no damage whatsoever.



BEFORE THE WINDS CAME THESE TIMBER HANGARS SERVED THE RICHMOND, FLA., NAVAL AIR STATION

HURRICANE DATA STUDIED

Long the scourge of the Florida coast, hurricanes have caused less damage to structures since the 1926 storm. The havoc wrought by that disaster prompted a program of education and of "hurricane-proof" design of structures. Although the U.S. Weather Bureau reports for Miami, covering a 33-year period prior to the time the hangars were designed, show a maximum velocity of 87 miles per hr (5-min period) and an extreme velocity of 96 miles per hr (fastest mile), most building codes call for a 120-mile per hr velocity to be used in design.



SKELETONS ONLY REMAIN AFTER THE HURRICANE AND FIRE

The Navy was fully aware of these data in designing the hangars for only 110 miles per hr. However, the need for speed to meet a national emergency, coupled with the necessity of conserving critical steel, warranted taking the "calculated risk" of storms having a velocity greater than 110 miles per hr. It also is worthy of note that the theory of accepting a "calculated risk" based on the probable incidence of unusually intense winds, and for specified material economies, did prove justified in that none of the timber blimp hangars failed during the critical wartime period.

Before proceeding to a discussion of what happened when the storm struck, it should be recalled that the hangars were three of seventeen which the Navy constructed during its emergency expansion of lighter-than-air facilities. Each hangar had a clear floor space of 234 ft by 1,000 ft, covered by an arch roof section of 157-ft maximum clear height. (Additional details of their design and construction are contained in articles in the October and November 1943 issues of CIVIL ENGINEERING.)

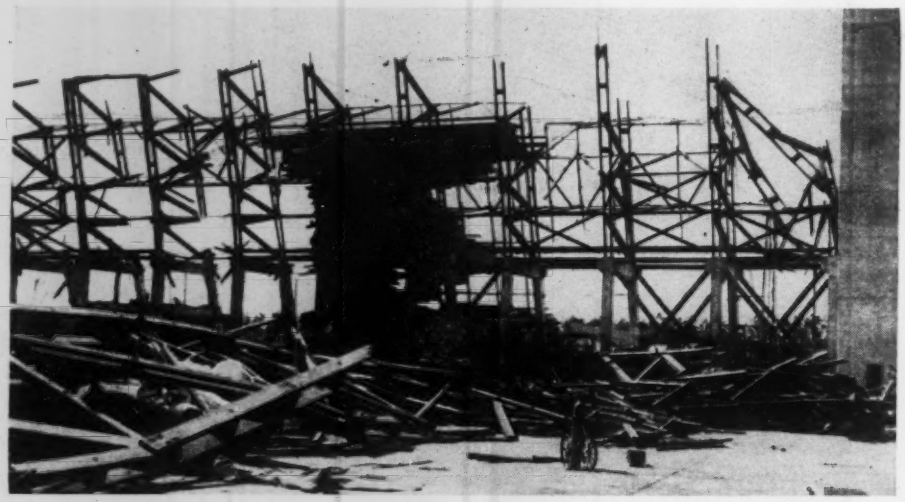
The three hangars withstood the force of the September 15 storm until it approached its peak velocity. Study of wreckage corroborates eye-witness accounts of total failure occurring to all three structures at the same time (probably the same gusts), and their destruction by fire in a very few minutes.

OVERSTRESS CAUSED FAILURE

A study of the wreckage indicated that the cause of failure was a general overstress rather than the failure of any particular phase of framing. The first apparent damage to Hangar No. 1 occurred in the skylights on the leeward side, which had been left open for equalization of pressure. The roof of Hangar No. 2 collapsed when the southeast corner gave way in two sections, immediately followed by the entire southeast half of the structure. Thereafter the northwest section remained intact for a period of perhaps five minutes before collapsing. Witnesses stated that the first crash of the roof in this hangar occurred after a large apparent surge.

Louver vents along the crown of Hangar No. 3 were first ripped completely off, immediately following which the entire structure collapsed. Considerable weaving of the doors was observed prior to the hangar's failure; however, they did not give way until the whole structure fell.

Reinforced concrete bents were left standing but were badly damaged by fire. Two of these failed in the top horizontal beam, as shown in the accompanying photograph, and many others had the anchor bolts which secured the arch trusses to the bent literally pulled out by uplift on the windward side. Timber arch ribs were in a state of collapse after the storm, except that in all the hangars some few bents, including the purlins, rafters, sheathing, and



GENERAL COLLAPSE DID NOT INDICATE ANY PARTICULAR WEAK POINTS

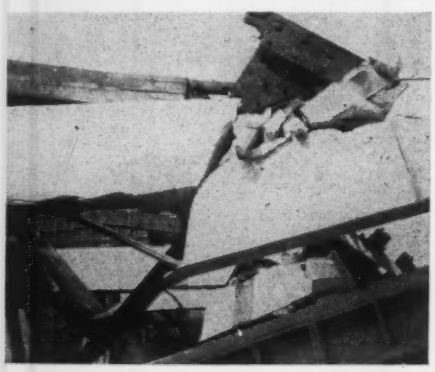
bracing were still in place up to about the third or fourth panel point from the bottom of the ribs. Large quantities of roofing, sheathing, rafters, purlins, ribs, and bracing, as well as other incidental members, were on the site adjacent to the hangars even though a substantial amount had been destroyed during the fire. In some cases, single pieces of sheathing, or roof boards, were in evidence. In other instances, sections of sheathing, possibly 20 ft or more square, were found on the ground. In some cases rafters were attached to the sheathing, and in others were detached. Some purlins were also found attached to the rafters which were attached to the sheathing. In some cases sections of the arch ribs had no other roofing members still attached, while in many instances sections of the arch ribs of three or four panels were intact and complete with purlins, rafters, and sheathing, or else the mutilation of such sections obviously occurred at the time of impact with the ground.

There were instances of approximately 125 ft of crane rail, which had been installed approximately 140 ft above the floor level, being found 110 ft outside the hangar and more or less intact. Many specimens of timber joints were found to be in perfect condition. The west half of the doors at the leeward end of Hangar No. 3, composed of three leaves, had failed. All other doors remained intact although a permanent set could be observed in the steel frame. This amounted to a maximum of about 3 in.

Although fire damage was secondary to wind-induced structural failure, a description of the effects of the fire permits an evaluation of the materials of construction. The fire broke out after the structural collapse. It probably resulted from electrical short circuits of the station power system, from stored aircraft battery assemblies, and from sparks caused by the falling metal striking concrete. Any of these would have ignited the high octane gasoline that escaped from ruptured tanks of the stored aircraft.

RESULTS OF FIRE EVALUATED

Temperatures must have been tremendous, possibly reaching 2,000 F, as was evidenced by fused glass, melted copper parts of planes, and the reduction of various other metal parts of planes and their motors.



FAILURE OF HORIZONTAL BEAM AT TOP OF CONCRETE BENT, CAUSED BY UPLIFT OF ANCHORED TIMBER ARCH

In addition, concrete bents and floors were deeply spalled.

In view of the catastrophe, a few observations on the various materials of engineering as they performed under stresses greater than those for which they were designed should prove of value as a future guide in their use. It should be remembered that selection of any material for these structures was based on considerations involving wartime substitutes, and in some instances the use was considered revolutionary.

The structural performance of timber has to be reviewed along with the performance of timber connectors. In some instances failure occurred in chord members, while in other instances joints of the chord members were completely torn apart. Bolts of the joints were tight, connectors were sound, maintenance had been thoroughly adequate, and there was no evidence of rot in the timber. Failure could not be laid to the structural performance of this material. The fact is that wind forces at the time of the collapse were approximately two and a half times those for which the structures were designed.

The chemical treatment of the timber proved satisfactory as a fire retardent, and treated members were not seriously burned except where sprayed by gasoline. In fact, from the way the fire "burned out" unless exposed to intense flame sustained by other means, it is hard to conceive that these structures would have been destroyed by fire had not collapse occurred first.

The structural steel used in the frames of the doors performed as could have been expected. The permanent set of all the door frames indicated that the forces encountered were near maximum for any material that might have been used for the loads of this design.

Concrete was badly spalled, particularly in the hangar floors, where the effects of the heat penetrated 3 and 4 in. The failure of the bents and anchors was simply one of extreme overstress.

The asbestos board used for door covering did not pull off to any marked degree but was shattered in a few instances by flying debris. The damage was relatively minor.

In concluding this report of damage, it would be a serious omission to overlook the human factors. There were available in each hangar between fifty and one hundred men for damage-control purposes. Considering this large number of personnel exposed to flying timbers at collapse and the subsequent intense fire, it is remarkable that only one life was lost. All other injuries to personnel were superficial and minor. It is indeed a tribute to the efficiency of the Navy's damage-control program and station disaster orders as well as to superb leadership, under high stress, of the station's Commanding Officer that no greater human loss was incurred. Safety of personnel was held paramount.

Opportunity for Engineers and Contractors in Housing Program

By KIRBY SMITH, M. ASCE

REAR ADMIRAL, CEC, USNR, SALES MANAGER, RAYMOND CONCRETE PILE COMPANY, NEW YORK, N.Y.

WARTIME Director of Construction for the Navy's Bureau of Yards and Docks, Rear Admiral Kirby Smith, chairman of the ASCE Construction Division's executive committee, has just returned to private life from a special four-month Washington assignment. His assignment was as general deputy administrator-expediter under Wilson W. Wyatt, Administrator, National Housing Agency, and Expediter, Veterans Emergency Housing Program. In this article, Admiral Smith, under whose direction the Navy built upward of five-billion-dollars worth of continental shore construction, gives his views on the status of the construction industry and the part the housing program can play in the plans of engineers and constructors.

OUT of the Veterans Emergency Housing program and its heavy demands on most of the available materials and much of the none-too-plentiful labor, there is emerging an inspiring illustration of the versatility and almost unlimited adaptability of the construction industry and the engineering profession. Both give promise of converting what might be devastating and industry-shackling conditions into an opportunity and an outstanding service in the country's most critical housing shortage.

In the same spirit, if not with quite as much speed, as they shouldered their wartime tasks, engineers and constructors are recognizing the "first" and "must" qualities in the housing program. Already many contractors, including some of the larger ones who formerly would not have been interested in such projects, have undertaken work in the housing program. This would seem to confirm my own notions as to opportunities which current conditions offer the industry, and which I would list in the following order:

Construction of large multiple-unit housing developments, in view of the definite trend in the Veterans Housing Program toward a much higher proportion of low-rental units.

Development and construction of large detached-unit housing projects, such as large contractors are in process of building in Philadelphia, Baltimore, and other cities.

Adaptation of organizations and equipment to prefabricated or on-site concrete housing units.

Greater attention to repairs and reconstruction, many of the projects in these categories being of a size that would interest even the larger companies.

The vast program of commercial and industrial construction now authorized and to be approved in the future.

The many projects in all parts of the country for roads, dams, bridges, and heavy construction, which are not now limited in any way except by the restricted material supply.

REAR ADMIRAL KIRBY SMITH

One of the answers to the question, "What are the construction industry's opportunities in 1946?" may be found in an analysis of the total amount of construction scheduled this year. That total is estimated at 15 billion dollars. Of this amount, approximately $4,600,000,000 will be expended for housing; $5,000,000,000 for repairs and reconstruction; and $5,400,000,000 for non-housing projects, including industrial and commercial structures, Government construction, and roads, bridges, dams, and harbor work. It is apparent, therefore, that the construction which must be carried on concurrently with the housing program is of considerable magnitude.

The three most important programs have been established by Congress as being: (1) the Veterans Emergency Housing Program, (2) the Veterans Administration Program for Care and Rehabilitation of All Veterans, and (3) the production and distribution of food.

This does not mean the irrevocable turning off of the spigot on production and needed construction. It means merely that these factors must be brought in line with the requirements of the Emergency Program.

Present restrictions on all construction, including housing, are due to the fact that our available materials supply is drastically short of requirements. Serious strikes which have upset virtually all industry have made it impossible to maintain production at even the rate attained earlier this year, and in order to meet our requirements, the current production must be stepped up nearly three times.

The labor supply problem will become the determining factor in construction as well as in industrial expansion within the next few months. If no crippling strikes occur for the next six or eight months, most construction materials will become available in quantities needed to serve all industry.

Reports from all sources indicate greatly stepped-up production for July, with reasonable prospects of accelerating this output during the rest of the year. Total employment has reached the staggering figure of more than 57,000,000, and some claims have been made that the once widely heralded but much-doubted "sixty-million-jobs" slogan has become a reality.

All in all, it would seem that progress is being made despite the difficulties and uncertainties encountered. Certainly these are times for far-reaching planning by the individual, the corporation, the community, the state, and the nation. Engineers, constructors, and others in allied fields must lead the way in supporting and participating in such long-range planning.

Engineers Plan New Wholesale Produce Market for New York

Summary of Address Before the Metropolitan Section, New York, N.Y.

By CLINTON F. LOYD

MADIGAN-HYLAND, CONSULTING ENGINEERS, NEW YORK, N.Y.

LIFE in a great metropolitan area is intimately dependent on its supply of foodstuffs. In the New York district, this involves the wholesale fruit and vegetable business largely concentrated in the area of the city known as Washington Market. A remedy for its congestion has long been a crying need. The basic engineering studies leading to a solution of this problem are thus of particular interest to civil engineers.

Designs now in an advanced stage will give New York the largest and most modern of all facilities for receiving and distributing wholesale fruits and vegetables, which must be handled with speed as well as economy. Before the contract plans were attempted, however, two years were spent in intensive research on all phases of the market operation and the preliminary design. The studies resulted in establishing a set of facts which could be interpreted to produce the engineering measurements for the market structure and facilities.

The methods used in obtaining and applying these facts form the basis of this article. The data given are a condensation of a lengthy factual report, with interest centered principally in the development of an approach which eliminated guesswork from the design.

The real growth of this New York market came with the advent of the railroads. Each railroad constructed its own piers containing facilities for the delivery of fruits and vegetables in the city, and the wholesalers were given space in these facilities to carry on their trade. Near the southern end of Manhattan and near the Hudson River docks was one of New York's principal jobber markets (Fig. 1). From 1920 on, an ever-increasing amount of produce arrived by truck. The wholesalers, being located on the railroad piers, could not accept the motor-truck deliveries and of necessity these had to be handled by the jobbers on nearby Washington Street, which runs parallel to the river front. This development made wholesalers out of the jobbers, and in order to protect themselves the wholesalers on the piers were forced to move to Washington Street.

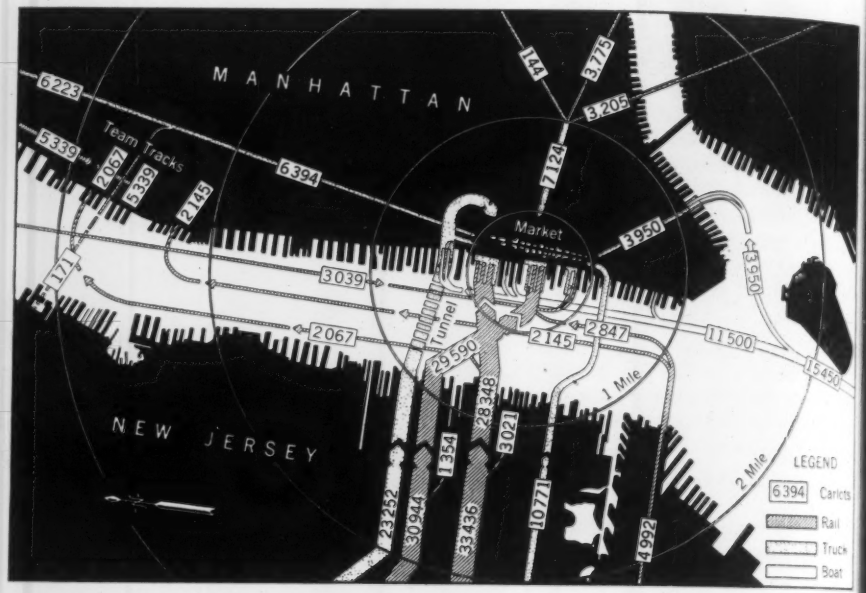


FIG. 1. CARLOTS OF PRODUCE AND POINTS OF ENTRY TO LOWER MANHATTAN MARKET

The result was a complete merging of the functions of the jobber and the wholesaler in the Lower Manhattan Market, and with the further increase in motor-truck deliveries, there arose a very acute congestion problem. Washington Street is but 30 ft wide from curb to curb. Practically every building in the area was constructed before the turn of the century. Trade is conducted on the sidewalks, with great loss due to damage, to say nothing of theft, and with very unsanitary conditions generally.

One of the principal points of research was the factual data concerned with the flow of produce and the determination of its characteristics. It is of extreme importance to appreciate the magnitude of this market and the service it performs. One out of every 8 carlots of fruits and vegetables produced in the United States for sale in unprocessed form finds its way to the markets in New York City; one out of every 11 goes through the Lower Manhattan Market. Part of this produce is redistributed throughout the North Atlantic Seaboard. Because of its magnitude the market acts as a "sale of last resort" for produce throughout the country, and as a result sets the price of fresh fruits and vegetables over the whole nation.

To study the entire problem it is necessary to analyze the "unloads" in the metropolitan area. These unloads are measured in terms of carlots. The amount is represented by an average railroad car of produce, or an average of 14½ tons. This carlot yardstick is used also to express produce volume brought in by all other methods of transportation, such as boat or truck.

The volumes are shown graphically in Fig. 2. The decline after 193 was due to several factors. The first and probably the largest, was the depression; the next was the end of prohibition. About 17,000 cars of juice grapes were brought into the area in 1930. New markets have been built in some of the outlying districts such as Albany and Buffalo and, with the increase in population in these areas, have become able to handle carload lots of produce. As a result, these cities are not dependent on Washington Market for the purchase of all their produce. These factors have contributed a good deal toward the decline of rail-borne pro

duce, although a great deal of this decline can undoubtedly be attributed to the increase of truck-borne produce.

Another extensive study showed the distribution by months over eleven years. Plotting of these data showed one most significant aspect—namely, the similarity of pattern, year after year. It served to emphasize the regularity and predictability of the market and thus gave added confidence in the value of the surveys.

Data showing the breakdown of the points of entry and the method of transportation of incoming produce can best be shown by a tabulation, such as Table I. This shows that 69% goes to the Lower Manhattan Market. A significant feature of this table is the amount that comes in on the various team tracks—where a truck backs up to a freight-car door to take delivery. The Manhattan team tracks are located just north of the Washington Street market at about 30th Street. More than half of the produce brought in on these team tracks goes to the Lower

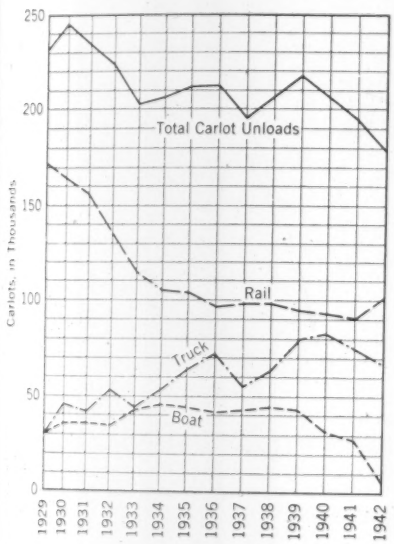


FIG. 2. YEARLY CARLOT UNLOADS, NEW YORK CITY, 1929 TO 1942

Manhattan Market and the rest is hauled away directly to outside purchasers. This is also true of the New Jersey team tracks. This is a very significant factor in the location of the market, as these team tracks have been built at great cost and comprise an essential facility. If the market were moved very far from these tracks the building of a similar facility would be required.

Indicated on the map (Fig. 1) is the flow of incoming produce into New York City in 1940.

The site of the existing market is the hub of the arterial system of the

TABLE I. COMPARISON OF TOTAL NEW YORK UNLOADS WITH LOWER MANHATTAN MARKET UNLOADS, FOR 1940—IN CARLOTS

FACILITY	LOWER MANHATTAN MARKET	OUTSIDE OF MARKET	TOTAL FOR NEW YORK METROPOLITAN AREA
By Rail:			
Manhattan R.R. piers	63,824	0	63,824
Manhattan team tracks	9,552	3,183	12,735
New Jersey team tracks	4,374	1,458	5,832
Other Metropolitan R.R. yards	1,175	10,570	11,745
By Truck:			
Dealers' markets and chain stores	47,541	8,390	55,931
Farmers' markets	1,000	25,374	26,374
By Boat	15,450	15,887	31,337*
Totals	142,916	64,862	207,778*

* Includes bananas.

metropolitan area. It is one of the big factors favorable to the existing location of the market. There are many other reasons, the most important being the danger of what is colloquially called a "split market."

If this market were moved to any other location, the existing piers would have to be kept as a freight terminal, for the railroad companies bring in on these piers as much tonnage in less-than-carlot freight (that is, individual packages for delivery in lower Manhattan) as they do fruits and vegetables. It would therefore seem to be impossible to shut off from this terminal the delivery of fruits and vegetables for those merchants who might refuse to move out of the existing location. It is true that a great many firms could be enticed to leave the existing location. This, in fact, would make the condition of the remaining merchants that much better and certainly contribute to a "split market." If this should happen a buyer purchasing at one market would be likely to find that his competitor had bought the same commodity more cheaply at another market on the same day. The result would be complete confusion in both the purchasing and the price structure, and eventually one of these markets would become the primary market.

A further breakdown of the figures shown in Table I is the daily receipts. They are of greater design importance because the market must be able to handle the required daily volume. So the daily unloads for 1940 were plotted. Like the monthly unloads, they showed remarkable uniformity of pattern. Significantly they showed a great many peak days all through the year, with receipts in the neighborhood of 1,000 cars; practically all of these occurred on Mondays. The maximum of about 1,100 carlots (June 10, 1940), was taken as a typical peak day upon which to base the design.

In order to extend the volume into the future so as to design for a reasonable increase, a study was made of the trend as compared with the population, which produced a figure of 250,000 cars for 1960. By multiplying this by the factor which was determined in the survey, we were able to get the peak day for 1960. Table II shows a comparison of this peak day with June 10, 1940.

After a very thorough study of the problem, it was evident that the automotive method of transportation was the real key to the solution. All the produce must be carted away, and at least half of it is brought into the market by trucks. It was therefore decided to make two very exhaustive traffic surveys, one in December and one in June, to get the winter and summer characteristics. To make each of these surveys, 135

TABLE II. LOWER MANHATTAN MARKET—UNLOAD FIGURES FOR TYPICAL AND FOR EXTENDED PEAK DAY, IN CARLOTS

	TYPICAL PEAK DAY June 10, 1940	EXTENDED PEAK DAY June 10, 1940 + 12%
Rail:		
Piers	596	666
Team tracks	28	33
Other	3	3
Total rail	627	702
Trucks	285	320
Boats	98	110
Total Lower Manhattan Market	1,010	1,132

men were required. The usual method, by which a cordon of counters is thrown around an area and movements in and out are counted, would not do at all. Most of the trucks are covered, making identification difficult. Further, the produce traffic is only a very small percentage of the total on the street system in the area. We therefore decided to make the survey by a station method.

SPECIAL TRAFFIC SURVEYS

For this purpose the market area was divided into a number of districts, each comprising about four or more square blocks. These, with the adjacent pier districts, covered the entire area. Each of the two surveys was conducted on three consecutive days, starting on a Sunday night, when a peak period regularly occurs.

One part of the survey was a volume count. A man was assigned to count the trucks at the curb of each city block, making a continuous

round of his block every half hour, putting down the time, the license number, and whether the truck was parking, loading, or unloading. These counts were collected and sent to the International Business Machine Company, which returned the cards sorted as to license numbers. Each set of license-numbered cards were marked and placed in order as to time, and as to whether the truck was

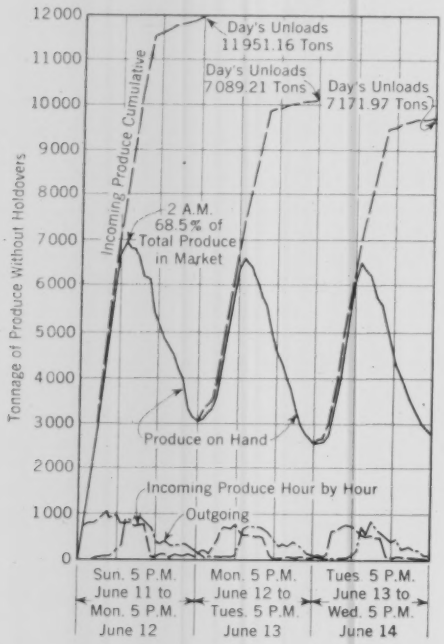


FIG. 3. FLOW OF PRODUCE IN LOWER MANHATTAN MARKET DURING TRAFFIC SURVEY, 5 P.M. JUNE 11 TO 5 P.M. JUNE 14, 1944

Holdovers Amounting to 3,990 Tons, on Hand at Start of Survey, Are Not Included in Tonnages Indicated

parking, loading, or unloading. These cards were then plotted on a graph in a manner which eliminated duplicates and made it possible to observe the operation of every truck and to score each trip it made. We thereby knew the length of time it had been in the market and just what it had done.

Besides this volume count, men were stationed to cover each of the areas of four city blocks in a regular route, and were assigned the job of questioning the drivers. A coverage of 33% was attempted. Cards were provided for this purpose—one type for unloading and another for loading. The object of these questions was to determine the weight of the load, the origin or destination, and the route used. By applying the results of the questions to the total counts, we were able to obtain the total load carried, the distribution of origins and destinations, and the routes traveled by incoming and outgoing trucks.

It was very interesting to note that only 1.4% of the trucks went to the Borough of Queens, and 26.6% to the Borough of Brooklyn. This is primarily because the secondary market in Booklyn serves both Queens and Brooklyn, there being no secondary market, as such, in Queens.

Another very important feature is the percentage that leaves the market destined for areas outside the metropolitan area. By adding Long Island, Up-State New York, New England, New Jersey, and others, it was found that 35.9% leave the city.

One of the primary objects of the survey was to determine the number of trucks required to haul a carload of produce for each movement. This is an extremely important feature because sufficient space must be provided for the trucks to back up against the platforms of the market buildings. The survey showed that, on an average, 2.97 long-distance trucks were required to bring one carload of produce into the market; 4.64 trucks were required to bring a carload of produce in from the team tracks; 5.2 trucks were required to carry away one carload from the store area; and 4.01 trucks were required to carry away a carload from the piers.

Another of the important principles deduced for the design of the Lower Manhattan Market is shown in Fig. 3. Under the particular method of operation which the trade has been using in the Lower Manhattan Market for many years, a certain overlapping of receiving and delivery hours occurs. This means that the total amount of produce in the market at no time equals the total volume of a day's receipts plus holdovers.

The flow of produce is indicated for the three consecutive days of our survey. It is seen that the total volume of produce unloaded on the first day, plus 4,000 tons of holdovers, is approximately 16,000 tons, but that the maximum volume of produce in the market occurred on this specific day at 2 a.m., and amounted to only 68.5% of that total. For design purposes this percentage was assumed at 75%. Since the area requirements are a direct function of the maximum daily volume in the market at any one time, it becomes evident that recognition of this important practical factor leads to considerable savings both in land acquisition and building construction cost.

In order to provide sufficient space in which to stack and store the produce, an extensive survey was made of space requirements. At an auction sale the grades must be stacked in a certain way for each commodity (Fig. 4). Each grade of a carlot shipment is arranged behind a sample, placed irregularly so as to give access to several crates of each grade.

At a private sale no samples are displayed and the material is not graded; therefore the stacks are quite regular. In the wholesale store, sales are made from samples displayed at the entrance to the store, and the produce is stacked inside in the most economical manner.

As an illustration of the extent of these observations, 275 studies were made covering 39 types of produce. These observations were based on wartime loads (1944), and after conversion to normal capacity it was found that it required, on an average, 300 sq ft of area for a carload lot This is exclusive of the aisles, as the designer lays out the aisles as an addition to the actual stacking floor area. A thorough investigation was also made of all types of mechanical equipment and handling devices, of refrigeration and the frozen-food industry, of the time required to load

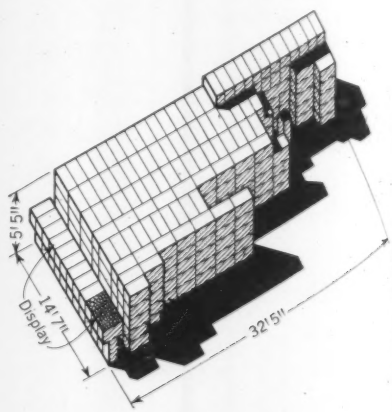


FIG. 4. SURVEY OF STACKING OF 525 CRATES OF ORANGES, REQUIRING 475 SQ FT OF FLOOR AREA

and unload trucks and railroad cars, and of possible airplane transportation of produce.

Each item of information finally was translated into terms expressing the length of platform, truck spaces, and square feet of area needed, and a summary prepared, which gave the designers a concrete set of rules to go by. In this way the investigations were completed for the major groups of data. Only on this basis could the new facilities be designed so as to be at the same time adequate and economical. An article describing the application of these studies to the actual design of the new Washington Market is in preparation. This second paper is being planned for a future issue.

Coal Fines to Offset Cost of Culm Elimination

Schuylkill River Desilting Project to Recover High Btu Fuel

By JAMES H. ALLEN, M. ASCE

CHIEF ENGINEER, THE INTERSTATE COMMISSION ON THE DELAWARE RIVER BASIN, PHILADELPHIA, PA.

MULTIPLE benefits will be derived from the Schuylkill River culm-elimination program—a joint undertaking of industry, the State of Pennsylvania, and the Federal Government. Water supply, navigation, and flood control will be among the operations to profit directly and considerably from the project, which is already under way. Responsibility for preventing the discharge of silt into the river will be undertaken by the coal operators, while the Commonwealth of Pennsylvania will dredge existing deposits and construct desilting basins. The U.S. Engineers have recommended their participation in dredging the channels of the lower river. This subject was discussed by Mr. Allen before the Philadelphia meeting of the Sanitary Engineering Division, ASCE.

BEST part of the whole story of the Schuylkill River culm-elimination program is the indication that a considerable part of the costs for clean-up work will be repaid through recovery of valuable coal fines. Coal from mining operations upstream forms a large part of the sediment which has afflicted the river with a "creeping paralysis." A three-party program to cure this condition has been brought about through the efforts of "Incodel," as the Interstate Commission on the Delaware River Basin is known to its friends. Incodel's proposal has brought together the coal operators, the Commonwealth of Pennsylvania, and the Federal Government in what adds up to a 34-million-dollar project.

Today the river and a large part of its valley are in a deplorable condition. A major portion of the so-called southern anthracite coal field occupies 270 sq miles of the upper Schuylkill watershed. Here a coal boom was started some 140 years ago. The area was denuded of its virgin timber for use in the mines, and mounds of rock, slate, and other wastes, including much fine coal, began to fill the narrow valleys. All through this period, until 1945, state government in Pennsylvania, fearing to place a burden on its major industry that would put it in an unfavorable position economically with competitors, permitted the industry to despoil the region without restraint.

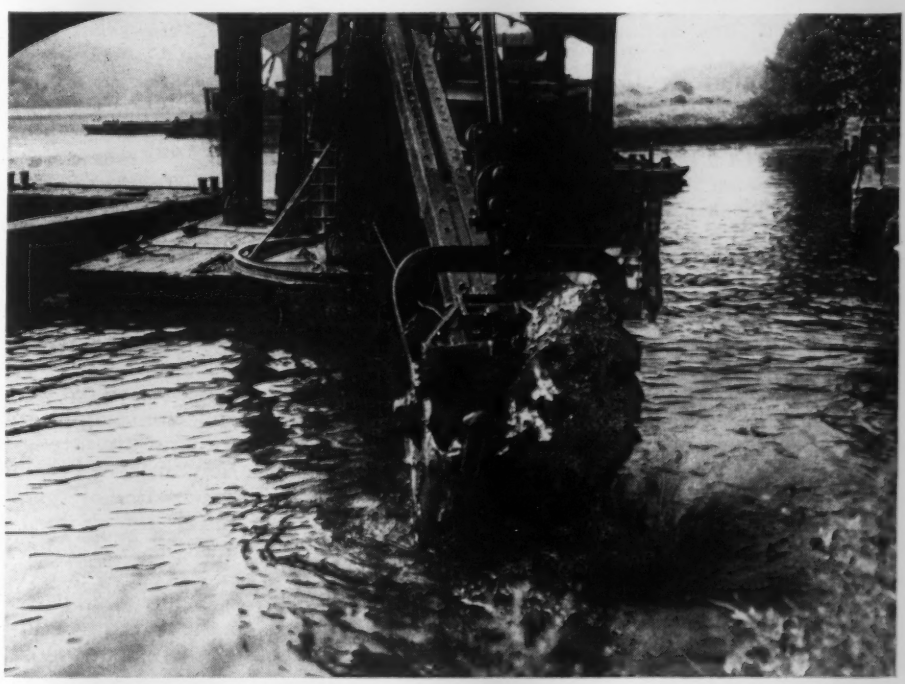
POLLUTION AND DESPOLIATION

And so, with the production of an average of 20,000,000 tons annually, the mounds of slag and wastes took on the proportions of mountains, completely altering the topography of the region. Under the policy of "get-the-coal-regardless-of-the-consequence," strip mining, consisting of removal of anthracite from veins near the surface, came into practice. The overburden from this process is cast aside in unsightly masses, and great gashes are left in the hillsides. Being easily eroded, much of the material heaped into mountains and gouged from the land soon finds its way into the streams.

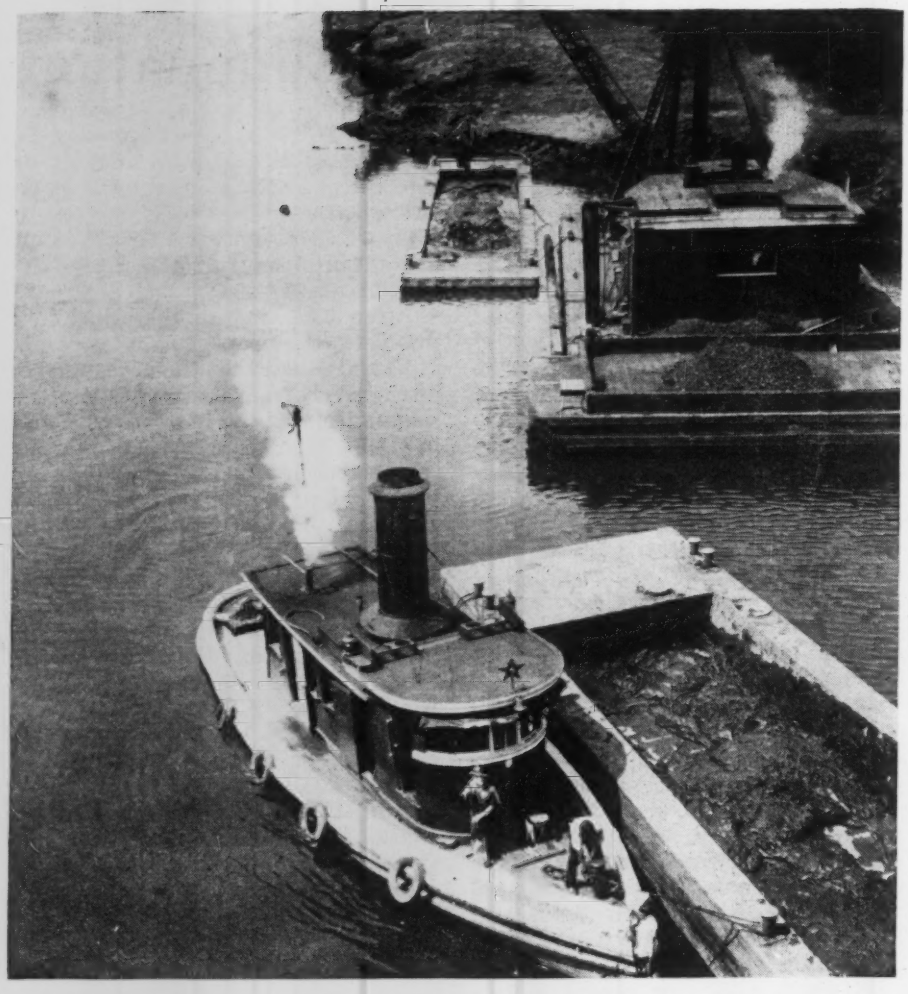
In addition to pollution by erosion, the more modern wet process of preparing anthracite results in the introduction of large quantities of fine coal into streams. Great volumes of water are used for washing coal, and little or no effort has been exerted to remove the solids before the water is discharged into the nearest watercourse. It is estimated that the collieries in the Schuylkill River basin have been discharging waste coal and silt into the river at a rate of approximately 1,000,000 tons per year.

After a century of these insidious practices, the people finally awoke in 1913 and found that the entire length of the river, from its sources to Fairmount Dam at the head of tidewater in Philadelphia, had been literally smothered by an accumulation of many millions of tons of coal fines and silt. The situation was so bad then that although the Pennsylvania Legislature passed a law intended to prevent it from getting worse by outlawing the further discharge of wastes into the stream, the State Water Supply Commission estimated that it would probably take one hundred and fifty years for the river to redeem itself under natural processes of purification.

But, to make things worse, because of the tremendous influence of the coal lobby, the law was never enforced. In fact, it was supplanted by a later law, enacted in 1935, applicable and drastic as regards all types of pollution. But in this law the discharge of drainage containing coal culm was virtually legalized in that it was exempted from the provisions of the act until, in the words



DREDGING COSTS RUN HIGH IN REMOVING CULM FROM SCHUYLKILL AT INTAKE OF BELMONT PUMPING STATION, PHILADELPHIA



SILT ISLANDS CONTAIN A LARGE PERCENTAGE OF COAL FINES

of the act, "such time as practical means for the removal of the polluting properties of such drainage shall become known."

Incodel undertook to review the situation in its entirety and, as a result of this investigation it announced, in October 1943, that the time had come for all interested parties to get down to brass tacks, and offered a sound and practical program for the restoration of the Schuylkill River. Contrary to previous suggestions, the Commission's plan not only pointed to the methods required for its solution, but made specific recommendations covering responsibilities for carrying them out. It claimed that the project was an undertaking which involved joint, cooperative, and concurrent participation by the Federal Government, the Commonwealth of Pennsylvania, and the coal industry. The responsibilities of each agency were allocated in the following manner:

1. *Coal Operators.* That the cost of improvements determined to be necessary to prevent the further discharge of coal, culm, and silt into the river, estimated to be approximately $6,000,000, should be borne by the mine operators.

2. *Commonwealth of Pennsylvania.* That the Commonwealth of Pennsylvania should be held responsible for the dredging of the existing culm deposits in the basin area above Norristown. The state also was called upon to finance the construction of desilting basins in the headwater region to retain any material which could not be recovered practicably by the industry or which might be washed into the streams by erosion.

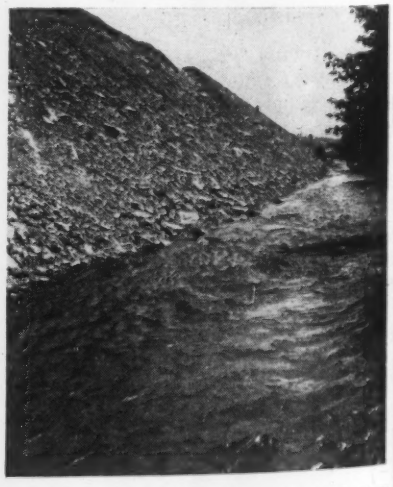
3. *Federal Government.* That the Federal Government should agree to participate in the program by dredging the accumulations in the section of the river between Philadelphia and Norristown during the prosecution of the state and the coal-industry projects. It was emphasized that otherwise the time required for the redemption of the river in Philadelphia, the section where it was most felt, would extend over a period of fifty or more years. It was also pointed out that the Federal Government would be relieved of an annual maintenance expense of about $400,000 required to dredge the silt from the navigable section of the river if the project were tackled by all hands at one time.

In less than two years after the announcement of the Incodel program, the problem was on the way to being solved. The Federal Government, the State of Pennsylvania, and the coal industry had joined hands to carry it forward.

Fortunately the state administration, under the leadership of Governor Martin and Attorney General James H. Duff, an ardent conservationist, put its stamp of approval on the proposed program. The Incodel recommendations were adopted in their entirety during the 1945 Pennsylvania Legislature, and the state obligated itself to the expenditure of $15,000,000 over a period of six years to carry out its part of the project. It appropriated $5,000,000 for work to be undertaken in the first two years.

While these negotiations were going on, the Commission prevailed upon the Committee on Commerce of the U.S. Senate, and upon the Committee on Rivers and Harbors of the U.S. House of Representatives, to direct the Army Engineers to review its previous report on the Schuylkill River to determine whether the recommendations therein should be changed in any way. The Army Engineers reversed their previous conclusions, and recommended that the Federal Government participate in the project to the extent of $13,000,000.

These recommendations were concurred in by the Division Engineer, the Board of Engineers for Rivers and Harbors, and the Chief of Engineers. They were approved in April 1946 by the Budget Director and,



A SOURCE OF CULM IS MINE REFUSE BANKS SUCH AS THIS

COAL RECLAIMING UNDERTAKEN AT LEHIGH COAL AND NAVIGATION COMPANY PLANT—FINAL CLARIFICATION BASIN IN CENTER

shortly after, by the Rivers and Harbors Committee of the House of Representatives.

COAL INDUSTRY ADOPTS COOPERATIVE ATTITUDE

Although somewhat reluctantly, the coal industry has dropped its attempts to postpone the day of reckoning and is now complying wholeheartedly with the orders of the Pennsylvania Sanitary Water Board, the agency responsible for the enforcement of stream pollution measures, to submit plans for the construction of plants for the recovery of coal deposits from their wash-water processes. One of the largest collieries, the Lehigh Navigation Coal Company, actually beat the gun and constructed a plant during the war to prevent further pollution of the Schuylkill River streams by its mining operations.

Multiple benefits will be derived from the completion of the Schuylkill project. Considered in respect to navigation, the Federal Government, the City of Philadelphia, and private industry will be relieved of the necessity of constantly dredging mine detritus from the navigable channels of the Schuylkill and Delaware rivers. In recent years these agencies have been required to remove an average of 1,200,000 tons of such material annually. In 1944 the total was 1,500,000 tons and, if the project were not to be carried out, the situation would get progressively worse for many years. Its completion will result in the elimination of an annual maintenance expense of at least $500,000.

The project also will result in a material reduction in damages due to floods. The 30,000,000 tons of wastes now lying in the river have so obstructed the channel that the flood-carrying capacity of the river has been reduced to nil. Even moderate showers cause it to overflow its banks, with resulting damage to industry, business, and the general public.

The project will be particularly helpful in relieving the heavy and expensive load on municipal and industrial water works plants located along the river in Philadelphia and in the many other communities upstream. Under present conditions the amount of alum required to accelerate sedimentation in settling basins is as much as eight times greater than is required at water works of similar capacity securing their supply from streams uncontaminated by culm. Right now the city of Philadelphia is spending $520,000 to clear its Queen Lane Reservoir of culm deposits coming from the river. As things stand, filters must be taken out of service and cleaned much oftener than at water supply installations processing water of less turbidity. Water works operators are confronted with the necessity of almost constant dredging or reverse flushing in order to clear water works intakes.

CLEAR EFFLUENT FROM COAL RECLAIMING PLANT SHOWN BY AUTHOR ALLEN

Recreational use of the river is at present inconsequential, owing to its uninviting appearance and excessive shoaling. With the completion of the Schuylkill project, the river will be restored to its rightful and beneficial position as a stream of great beauty and esthetic appeal. It will enhance the value of the national shrine at Valley Forge Park. It will make Fairmount Park, with its scenic beauty, historical associations, handsome public buildings, world-famous zoo, and extensive recreational facilities, the largest and most attractive conveniently accessible recreation area in the country. It will make it possible for Fairmount Pool, the first above tidewater, to be fully used again for events such as the famed Henley regatta, a boating contest which attracted world-wide attention a few years ago. It will result in a general appreciation of property values along the whole length of the river.

All of these and many other benefits will be derived from the Schuylkill River project. But here is the best part of the whole story. There are indications that the job, aside from the benefits it will produce, may be otherwise self-liquidating. While approximately $35,000,000 will be required to pay for the necessary dredging operations, there is a possibility that a substantial part of this may be recovered by the sale of reclaimed coal. Approximately 50% of the deposits are coal fines of high Btu value. If they can be separated from the mud and other impurities in which they are embedded, at a reasonable cost, the project will pay for itself. That prospect now seems bright. But, even if it should not materialize, the project will be a bargain in any event.

Chicago's Public Works to Cost Nearly 300 Million in Seven Years

By Lloyd M. Johnson

Chairman, Chicago Engineering Board of Review

With an approved financing program, the City of Chicago is prepared to schedule public works projects over a period of seven years. Included are superhighways totaling 68 million dollars, sewers amounting to 58 million, and a 45-million-dollar airport. A feature of note to engineers interested in public finance (and what engineer isn't?) is that the major part of the program can be constructed without new financing.

A VAST program of needed public works has been prepared for Chicago, Ill., which should do much to catch up with deferred improvements and postponed maintenance. This "Greater Chicago Public Works Program" covers a seven-year period, from 1946 to 1952, and calls for the expenditure of $298,560,000 from funds available and to be financed. The magnitude and diversity of the program is shown in the tabulation of projects, Table I.

The first group of projects listed consists of improvements to be financed from current and accumulated motor fuel tax funds. During the past three years Chicago has received approximately 4½ million dollars annually in such funds but there has been a sharp increase in collections since V-J day, and it is expected that allocations to the city in 1946 will approach the previous high of slightly over seven million dollars, which was reached in 1941. It is proposed that improvements of major highways, bridges and viaducts, grade separations and superhighways (in part) be financed from current and accumulated motor fuel tax funds.

The seven-year improvement program provides for a continuing policy of construction and reconstruction, which will aggregate approximately 180 miles of major thoroughfares throughout the city, at an estimated total cost of $34,000,000. In addition to these projects, approximately $5,700,000 has been provided for street maintenance and the installation and operation of traffic control signals.

Bridges and Viaducts Listed

Bridges across the Chicago and Calumet rivers have been one of the most pressing needs for the development of the city since its founding in 1803. Many of those now in use are forty or more years old and were not designed for present traffic conditions. It is imperative that some be replaced by modern structures. The seven-year program includes the allocation of approximately $12,000,000 for the construction of ten new bridges, and about $2,000,000 for maintenance during the seven-year period.

Chicago's railroads have made the city the rail center of the world but they have also given it an interlaced system of tracks which seriously hamper the free movement of persons and vehicles. Approximately 1,000 miles of tracks have been elevated out of the total of 3,600 in Chicago. This indicates that there are still many miles of tracks where grade separations are desirable. The separation projects in the 7-year program constitute a start on removing the remaining grade-crossing hazards. In some cases the work immediately proposed involves the reconstruction of obsolete underpasses which are a threat to the safe movement of today's heavy volume of vehicular traffic; in other cases they consist in the opening of blocked streets. In all cases, their construction will definitely facilitate the movement of traffic, and will materially reduce accidents.

Table I. Distribution of Financing for Chicago's Seven-Year Program

Motor Fuel Taxes:	
Surface streets	$ 39,700,000
Bridges and viaducts	11,500,000
Grade separations	4,000,000
Superhighways (in part)	22,000,000
	$ 77,200,000
Revenue Bonds:	
New airport, with state and federal aid	$ 30,000,000
West Side subway	25,000,000
Washington Street tunnel	9,600,000
Jackson Street tunnel	9,600,000
	$ 74,200,000
Corporate Bonds Already Authorized:	
New airport	$ 15,000,000
Slum clearance	5,000,000
Street lighting	3,000,000
State Street Bridge	2,500,000
Playgrounds	2,000,000
Police and firebuildings	2,000,000
Waste-disposal equipment	1,500,000
Garage and repair shops	500,000
	$ 31,500,000
Additional Corporate Bonds:	
Superhighways	$ 42,000,000
Sewers	58,160,000
Street lighting	5,000,000
Playgrounds	2,000,000
Streets and alleys	8,000,000
Garage and shops	500,000
	$115,660,000
Grand Total	$298,560,000

Superhighways a Joint Undertaking

Included in the greater Chicago program is construction of important units of the city's 70-mile comprehensive superhighway plan, which was originally approved by the City Council in 1940. This comprehensive plan, estimated to cost $340,000,000, includes seven depressed-type multi-lane modern expressways with a traffic capacity of 572,000,000 vehicle miles annually. The system will radiate from the central business district to all sections of the city, and there will be two connecting traffic distributor units.

Obviously not all this work can be completed in seven years. It is estimated that superhighway work amounting to $205,200,000 can be done. The State of Illinois and the County of Cook have agreed to contribute one-third of the cost for two of these routes, and with such an arrangement worked out for the other routes of the seven-year program, the city will have to finance one-third of that amount, or $68,400,000. Located in conformity with the master plan, the superhighways will stimulate the redevelopment of neighborhoods and communities.

Bonds Already Authorized

For construction and improvement projects, the City Council and the electorate have already authorized the issuance of approximately $31,500,000 in bonds. These projects include the completion of the State Street Bridge, street lighting, new waste-disposal equipment, slum clear-

ance, playgrounds, police and fire buildings, garage and repair shops, and airport facilities.

Some projects may be financed in whole or in part by revenue bonds. Under existing statutes the city is empowered to issue such bonds for airport facilities, these bonds to be financed and retired wholly from revenue to be derived from such facilities. It is expected that the new Douglas Airport will be financed in part by such bonds. It is proposed that revenue bonds be issued for the construction of the West Side Subway and the Washington and Jackson Street tunnels.

AIRPORT AND SUBWAYS FINANCED

It is expected that the new airport will cost approximately $45,000,000. Of this amount, $15,000,000 has already been authorized and is now being used for the acquisition of land and for initial airport construction. To finance the remaining $30,000,000, it is expected that aid will be obtained from state and federal governments, and this plus the revenue obtained by the sale of revenue bonds will cover the remaining cost. The sale of revenue bonds has already been authorized by the state legislature, and the federal Congress has passed a bill providing $500,000,000 for assistance in airport construction.

Subway service is now being provided for the North and South sides of Chicago and soon will be available to the northwest side. The heavily populated West Side, and the southwest side, have long been without adequate rapid transit. In addition, the heart of the city is being paralyzed by traffic congestion.

Also included in the Greater Chicago Program is a 4-track subway to the West Side, which will likewise benefit the southwest section of the city, and two local transit subways that will materially reduce traffic congestion in the central business district, thus improving local transit generally. This West Side subway will extend from the leg of the Milwaukee Avenue–Dearborn Street subway in Congress Street west under the river and in tunnel to Halsted Street, thence in a median strip of the West Superhighway to Kedzie Avenue to join the Garfield Park elevated, with subways in Clinton Street and Kedzie Avenue connecting with the Lake Street Elevated. The four-track facility from Halsted Street to Kedzie Avenue will serve and replace all West Side rapid-transit traffic in this area.

This program includes only that part of the West Side Subway the construction of which should be coordinated with the Congress Street Superhighway. It is estimated that this part will cost $25,000,000, out of a total cost of about $42,000,000 for the complete project.

It is planned in this program to build a two-track streetcar subway extending from Clinton Street east to a turnback in Grand Park under both Washington Street and Jackson Street. These subways will permit the removal of all east-west streetcar tracks from the Loop area and will thus greatly increase the vehicular-traffic capacity of these streets.

The Jackson Boulevard subway will have direct access to the La Salle Street and Union stations and to the Van Buren Street station of the Illinois Central Railroad. Direct connections from the Washington Street subway will be to the Northwestern Station and to the Randolph Street Station of the Illinois Central Railroad.

The transit work proposed under this program totals $44,200,000, of which $25,000,000 is for the West Side Subway and $9,600,000 each for the two streetcar subways. This work is to be financed by the issuance of revenue bonds. Under the terms of the Chicago Transit Authority Ordinance, the Authority is to pay to the City 1% of its gross revenues until January 1, 1952, and thereafter 3% of its gross revenues. The income from this to the city is estimated to amount to $65,870,000, leaving a reserve of $21,670,000 over and above the cost of these subways for financing and other projects. This plan contemplates a minor change in the Cities and Villages Act permitting the issuance of revenue bonds supported by income from the complete system of subways, instead of the income from only the subways to be financed by revenue bonds.

SLUM CLEARANCE AND OTHER PROJECTS

Chicago has approximately 23 sq miles of residential area which has been classified as "blighted" and "near blighted" by the Chicago Plan Commission. These areas contain a total of 242,000 dwelling units in which reside 840,000 persons, about one-fourth of the city's population.

The housing in these areas is the oldest in the city. Many of the frame structures—brick two- and three-flats, and "lean-tos"—are over sixty years old. Some date back to the Chicago Fire of 1871, a few even to the Civil War.

The City Council has designated three areas on the South and West sides as sections to be purchased by the city and cleared by the Chicago Housing Authority for development of standard housing. The city and state funds together, totaling 15 million, it is estimated may finance the purchase and clearing of about 75 acres of slums as sites for new, modern housing for approximately 15,000 persons.

Completion of the sewer projects included in this program will augment and relieve the present sewer systems in all parts of the city. The estimated total cost of all projects included in this city-wide program is approximately $103,000,000, but the $58,000,000 included in the present program will go a long way towards relieving the worst conditions in the city. The present program will directly benefit almost two million people residing in 15 widely scattered areas aggregating approximately 65,000 acres.

FINANCING OF PROGRAM

It will be noted that by far the major part of this program can be constructed without new financing. Funds now available or to become available include motor fuel tax revenues, proceeds from the bonds previously authorized, and proceeds from the sale of revenue bonds to be retired by use of the city's transit and airport revenues. There remains a balance of $115,660,000 to be financed by the issuance and sale of new corporate bonds. This bond issue was approved by the voters at a referendum on June 3, 1946.

This figure was the limit set by Mayor Kelly in his request to the Engineering Board of Review in setting up a sound public works program for Chicago without raising the tax levy on the funded debt. These new bonds can be serviced by an annual tax levy substantially less than the average funded debt levy for the past 20 years, and even less than the 1945 annual tax levied for the retirement of bonds outstanding. The average of the tax levies for this purpose for the years 1920 to 1945, inclusive, amounted to about $13,800,000. This average for the next 19 years, which includes the financing of this program, will be about $11,600,000, and the 1945 tax levy for funded debt was upwards of $14,000,000.

This entire, carefully coordinated program was set up by Chicago Engineering Board of Review, whose members are the heads of eight major public works departments. Its approval has set in motion a whole pattern of major improvements.

Engineers' Notebook

Circular Calculator Simplifies Sewer Design

By JAMES W. FEILD, M. ASCE

CHIEF, SEWAGE UNIT, ENGINEERING DIVISION, OFFICE OF THE CHIEF OF ENGINEERS, U.S. ARMY, WASHINGTON, D.C.

APPLICATION of the principle of the circular slide rule offers a rapid and simple device for calculating sewer hydraulics, particularly in respect to analysis of velocity at low flows. Owing to the cumbersomeness of present methods of analyzing velocity, this very important phase of design is too often neglected. The calculator here described is of handy size, is simple to operate, has a wide range, is accurate, and is rapid in the solution of problems. The calculator is based on the Chezy formula and is adaptable to any of its variations which involve purely exponential functions, whether for gravity flow or pressure flow. In the patent application, for purposes of illustration, drawings for a gravity-flow calculator were based on the Manning formula, $v = \frac{1.486R^{2/3}}{n} S^{1/2}$, and drawings for a pressure-flow calculator were based on the Hazen and Williams formula, $v = 1.318\ CR^{0.63}S^{0.54}$.

DESCRIPTION OF CALCULATOR

Features and operation of the calculator, in its application to gravity-flow problems, can be demonstrated by reference to Fig. 1, which shows reproductions of one of the working models. Both (*a*) and (*b*) are the same except for the position of Member 4. The device consists of four pivotally connected members made of plastic material and upon which scales are graduated along concentric circles. Member 1, the base member, is rectangular and has three imprinted scales. The outer scale, Scale "A," represents pipe diameter in inches. The intermediate scale is the rate-of-flow scale and is graduated to represent rate of flow in three different units of measure—gallons per minute, cubic feet per second, and million gallons per day.

The inner scale represents velocity in feet per second. Member 2 is of the general form of a sector of a circle provided with arcuate cutouts so as to avoid the covering of portions of the rate-of-flow and velocity scales which may be needed under some conditions. Two scales, the slope scale and the friction factor or n scale, are imprinted on Member 2. The slope scale cooperates with the pipe-diameter Scale "A" on Member 1. The n scale cooperates with an indicator pointer on Member 3. There are two scales, "B" and "C," and four indicator pointers on Member 3. Three of the pointers cooperate with the rate-of-flow scale to indicate the rate of flow in the three different units of measure simultaneously.

SCALES ARE INTERRELATED

The fourth pointer is for selecting the friction factor from the n scale. The pointers are suitably labeled. Scale "B" is a pipe-diameter scale which cooperates with the velocity scale on Member 1 to indicate the velocity in pipes of various diameters when flowing full and discharging the quantity indicated. Scale "C" cooperates with the rate-of-flow scale to indicate the ratio of liquid depth to pipe diameter. Scale "C" in this particular model is laid out in relation to, and for use with, the mgd indicator. This arrangement, however, is a matter of choice, and Scale "C" can just as well be laid out in relation to either of the other two flow indicators. Member 4 has a window indicator and one scale, "D," which is also graduated to represent ratios of liquid depth to

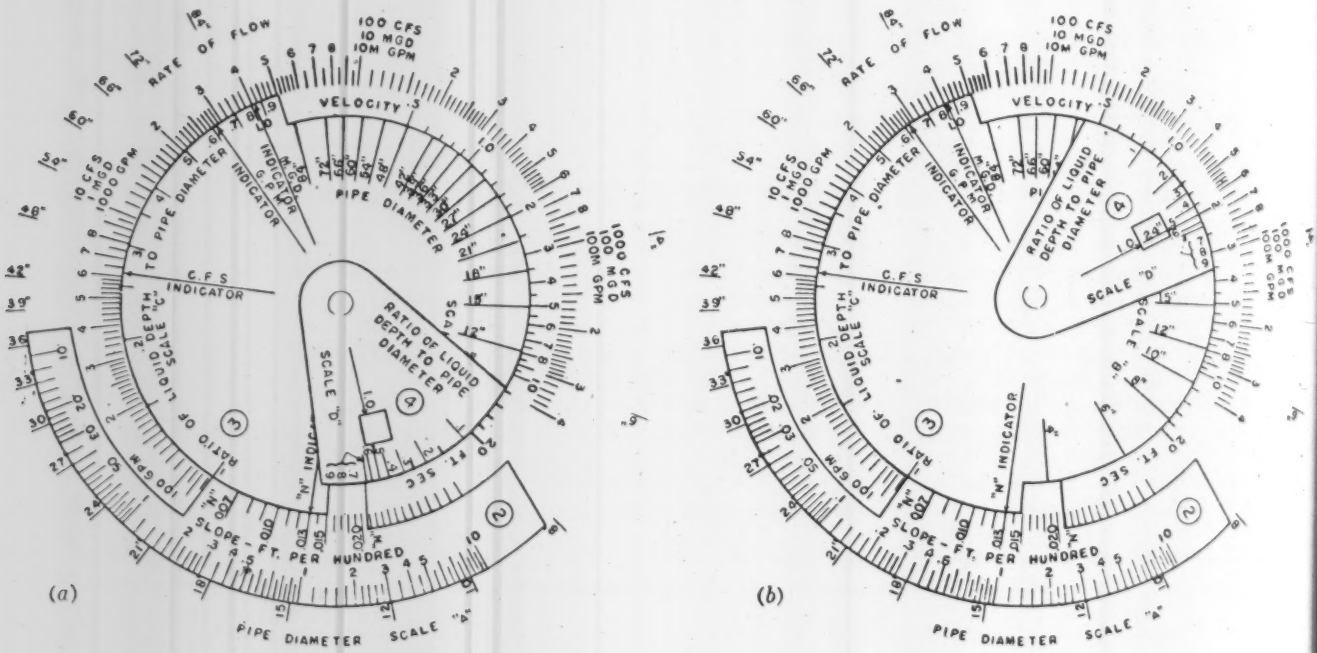


FIG. 1. CALCULATOR FOR GRAVITY FLOW IN PIPES, WITH SETTINGS (*a*) AND (*b*) FOR SOLUTION OF PROBLEM

pipe diameter. With the window indicator set at a selected pipe diameter on Scale "B," Scale "D" cooperates with the velocity scale to indicate the velocity for whatever ratio the liquid depth bears to the pipe diameter, as determined by the use of Scale "C."

ILLUSTRATIVE PROBLEM

The simplicity and rapidity of operation will be obvious from the solution of an illustrative problem which the model was set to solve when the photostats were made. Many types of problems other than the one to be described here come within the scope of this instrument. In fact, for practically any set of known conditions involving the hydraulic design of sewers, the unknowns can be readily determined.

Problem. Determine the slope and diameter of pipe required for the discharge of 4.05 mgd flowing full at a velocity of 2 ft per sec, in pipe whose n coefficient is 0.013; also determine the velocity in the pipe when the rate of flow reduces to only 0.5 mgd.

Solution. As in Fig. 1 (*a*), set Member 3 so that the mgd indicator coincides with 4.05 mgd on the rate-of-flow scale on Member 1. Set Member 2 so that 0.013 on the n scale coincides with the n indicator on Member 3. The required pipe diameter is 24 in., found on Scale "B," Member 3, opposite 2 ft per sec on the velocity scale, Member 1. The required slope is 0.077 ft per hundred, found on the slope scale, Member 2, opposite 24 in. on Scale "A," Member 1. For a rate of flow of 0.5 mgd under these conditions, the ratio of liquid depth to pipe diameter is 0.24, found on Scale "C," Member 3, opposite 0.5 mgd on the rate-of-flow scale, Member 1. With Member 4 set as in Fig. 1 (*b*), so that 24 in. on Scale "B," Member 3, is visible through the window indicator, the velocity at this reduced rate of flow is found to be 1.4 ft per sec on the velocity scale, Member 1, opposite 0.24 on Scale "D," Member 4.

The foregoing completes the solution of the specific illustrative problem in three simple settings of the instrument members, requiring only a few seconds. Other conditions as to pipe size, slope, and velocity under which the 4.05 mgd rate of flow could be discharged are also indicated in the figures without changing the setting of Members 2 and 3. For instance, 18-in. pipe on a slope of 0.35 ft per hundred would discharge the 4.05-mgd rate at a velocity of 3.6 ft per sec. Also, by the use of Scales "C" and "D" as illustrated, the velocity can be determined for any other rate of flow less than full pipe flow. For instance, at a rate of flow of 0.8 mgd, the ratio of liquid depth to pipe diameter is 0.3, and the velocity in the 24-in. pipe is approximately 1.6 ft per sec, indicated in Fig. 1 (*b*).

CHART HAS SPECIAL FEATURE

The principal advantage of the calculator over typical flow charts is in the feature of velocity analysis for flows less than full pipe flow. With this feature, a complete velocity analysis for all rates of flow in a selected pipe can be presented to the designer in one picture, which cannot be done by any other method known to the writer. It is hoped that in future designs of sewers more attention will be paid to maintaining self-cleansing velocities than has been the case in the past. The calculator as illustrated was conceived with this aim in view, and it is believed that a useful purpose can be served when it becomes available to designers.

Unusual Expansion Joints Used in High Concrete Walls

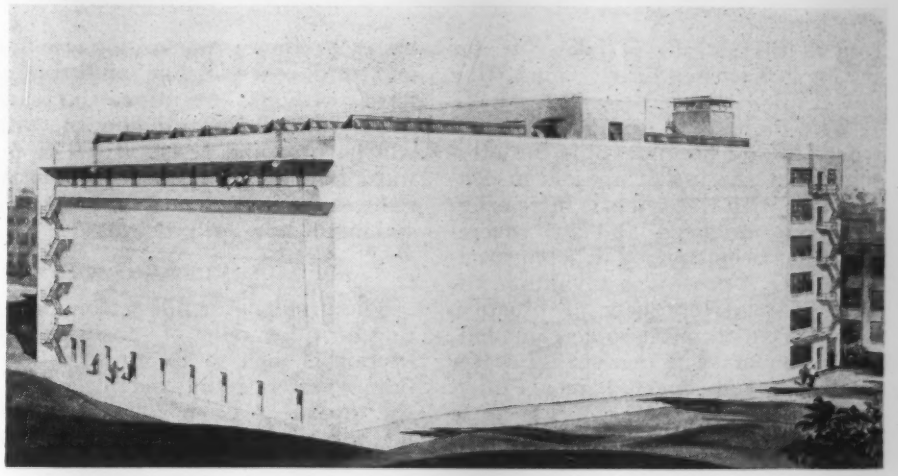
By ALFRED ZWEIG, ASSOC. M. ASCE

STRUCTURAL ENGINEER, ALBERT KAHN ASSOCIATED ARCHITECTS AND ENGINEERS, INC., DETROIT, MICH.

WALLS 59 ft high and only 18 in. thick enclose the new "stove" building for the Congoleum-Nairn Corporation recently completed at Kearny, N.J. Exceptional wind and temperature stresses in the reinforced concrete walls necessitated the use of expansion joints of a new type. These special vertical joints were placed at frequent intervals to permit distortion of the walls without buckling or cracking. In its completed form, the building is a solid-appearing concrete structure, 133 ft by 214 ft, resembling a storage warehouse. Its solid concrete walls enclose nine individual curing ovens or stoves. These walls were designed to withstand wind load during construction and operation and the full weight of process materials and equipment. The walls are practically free-standing, being tied transversely at the top by steel beams and at one end in the upper 18 ft only. Temporary ties were used to withstand wind pressure during construction.

The curing or oxidation of linoleum is achieved fastest and best at constant temperatures in excess of 150 F, and may run up to 180 F or higher. To maintain this high interior heat without wall buckling or distortion, in New Jersey winters of zero and lower, necessitated provision for expansion joints all along the exterior walls.

These vertical expansion joints (Fig. 1) are spaced approximately



REINFORCED CONCRETE WALLS OF STOVE BUILDING ARE UNSUPPORTED FOR 59 FT OF THEIR HEIGHT

25 ft on centers, and represent a new type of installation. Before being incorporated in the stove building, the joint was tested and proved in a model installation. Frequent spacing of expansion joints was determined upon to preserve the architectural treatment of the exterior walls from cracks or surface blemishes induced by high interior temperatures.

Two factors determined the wall thickness of the stove building: (1) wind load was assumed as 15 lb per sq ft; and (2) temperature inside the stove was assumed to reach a maximum of 185 F. In determining temperature action, two conditions were investigated.

The first was an equal temperature increase throughout the exterior walls from 60 F (the temperature during construction) to 185 F (the temperature during operation). Assuming expansion joints $^3/_8$ in. wide on the outside walls, it was easy to determine the spacing of these joints. The

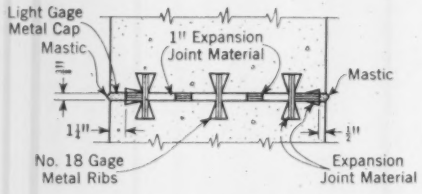


FIG. 1. METAL AND MASTIC EXPANSION UNITS USED FOR VERTICAL JOINTS

second temperature action considered was more unfavorable for the stress distribution in the outside wall—an unequal temperature distribution corresponding to zero outside and operating temperature inside. If the walls were not tied together at the top, this temperature action would result in the curling outward of the walls, the outside face of the wall contracting and the inside face elongating. This curling action is prevented by means of the steel roof beams. These introduce large stresses into the wall, but it has been designed to withstand them.

The interior 18-in. concrete walls have no intermediate expansion joints. Only two construction joints in the quarter points are provided.

The stove building is the first unit completed in a $2,000,000 expansion program which Congoleum-Nairn now has under way.

Air Jetting Aids Pile Sinking

By ERNEST E. HOWARD, M. ASCE
CONSULTING ENGINEER, KANSAS CITY, MO.

THE thanks of the profession are due to Admiral Bakenhus and to the members of the committees of the three Divisions for the recently issued Manual of Engineering Practice, No. 27, "Pile Foundations and Pile Structures." Their task has been long and arduous. The Manual presents a well written, clearly expressed assembly of information. Yet its very comprehensiveness makes surprising the omission of any reference to air jetting in the sinking of piles. Water jetting is discussed briefly; air jetting not at all.

Who first used air jetting, and where, would be impossible to determine, but the use of air jets in conjunction with water jets is increasingly being practiced and for several years has been covered in some specifications. A process so advantageous, even if relatively new in practice, would seem to merit some comment. Some readers will regret that water jetting is not covered more fully: that no suggestions are made as to the desirable types and sizes of jets, as to desirable pressures and volumes of water, as to pumps, etc. Manufacturers distribute information concerning pile hammers: corresponding information on jetting equipment is scanty.

The idea of air jetting for piles may have been first suggested by the action of air escaping from under the cutting edges of pneumatic caissons. Some dozen years past, the late Henry C. Porter, M. ASCE, of the Texas Highway Department, devised experiments demonstrating concerning seepage flow, that upward flow of water produces quicksand action in any sand, coarse or fine; and that almost without exception the same sands with downward flow of water will be firm and resistant. The upward flow and the quicksand action reduces the friction and thus eases the sinking of pile, crib, or caisson.

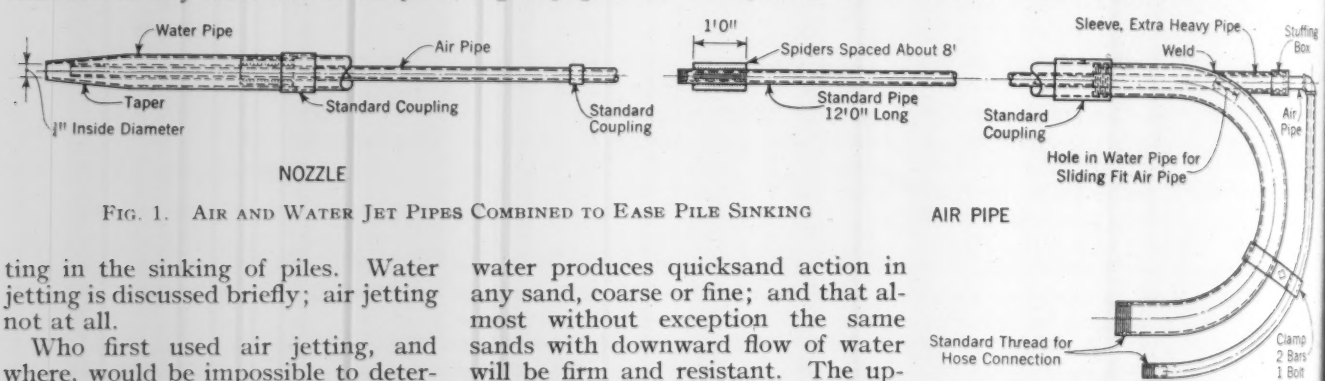


FIG. 1. AIR AND WATER JET PIPES COMBINED TO EASE PILE SINKING

AIR CAUSES UPWARD FLOW

The problem for pile jetting or jetting for other relief of subsurface soil friction is then to secure an upward flow of water around the pile or along the surface. Even upward turned jets will not always assure such a flow. Jet water may flow off in some other direction and may actually make driving harder instead of easier. Someone sometime may be able to devise something to cause water flowing from a jet pipe to move always upward. Meantime the less gifted have only to use air under pressure. The air must inevitably work to the surface. Its path may be indirect, but it must be generally upward.

Results secured by using a compressed-air jet in conjunction with a water jet discharging at about the same elevation indicates that at least some of the water tends to follow the air upward. Cases can readily be cited where double water jets combined with heavy driving could not secure the penetration desired. By adding compressed-air jets, the desired penetration was readily, and easily, accomplished. Air jets alone without water jets have been found effective for shallow depths for probing or for friction reduction. To reach depths suitable for deep foundations, air jets alone will not suffice and

water jets must be used with them.

For combined water and air jetting, a small air pipe is usually tack welded to the outside of the water jet pipe. This is well enough where the jet-pipe length does not have to be altered. But it is often necessary to alter this length for shipment and other purposes. To meet this need we devised for a client, some two years past, a combined water-air jet pipe that can be coupled and uncoupled with ease and built up to any length desired—by centering the air pipe within the water pipe. The general features of this combined water-air jet pipe are shown in Fig. 1. Discharge of the air jet just within the nozzle of the water jet appears to give good results.

Increased use of air jets, both for cassion sinking and for deep pile sinking can be expected. Several references to air jetting may be noted in recent articles in the technical press. Air jetting with water jetting is specified for sinking the cylindrical steel piles that will constitute piers for the construction bridge across the Missouri River for the Garrison Dam. Considerable accumulation of experiences with air jetting may be available for the next edition of the Manual.

Our Readers Say—

Experience at Early Society Meeting Cited

DEAR SIR: Mr. Crum's remarks about public speakers, in the July issue, are very worth while. For me, however, an example of failure to make a reasonably decent presentation was the beginning of that "tide in the affairs of men" which led to at least a little fortune.

When I first came to New York in the early nineteen hundreds I very faithfully attended the bimonthly sessions of the ASCE, at which papers were presented with varying degrees of interest and ability. At one session where a man with a black beard, muttering through his whiskers, with his back to the audience, was making cabalistic signs on a blackboard, I turned to a friend who was with me and said, "Oh! heck! I could write a better paper than that." He replied, "Well, why the devil don't you?"

A year or so later I did, and I have always been firmly convinced that that was the turning point which started me on my long, nefarious, more or less successful career. I endorse Mr. Crum's remarks, however!

FRED LAVIS, M. ASCE

New York, N.Y.

Actual Tests Urged in Analyzing Girt Angles

TO THE EDITOR: Many thanks to J. C. Early for his letter on girt angles, published on page 267 of the June issue. Thousands of dollars have been thrown away because so many engineers have designed girts as horizontal beams. Others determine angle or channel sizes by pure guess or "experience." What the practical designer would like to have would be a table of safe loads for angles and channels on spans most commonly used—that is, 15, 18, 20, and 25 ft.

Theoretical analysis of this type of member is complex and must be based on assumptions of the play in end-connection holes. In actual construction some girts could have an initial sag or compression while others on the same structure could have an initial tension. Therefore such data should be obtained from the results of a series of actual tests instead of being computed theoretically.

Anyone undertaking such analyses or tests should consider girts as they are most likely to be used. Mr. Early has shown the angle with toe out and the end connection made directly to the column. This type of construction is rarely used, at least in this country. The most common girt detail has the horizontal leg toed in and requires a girt clip for connecting to the column, as shown in the accompanying Fig. 1.

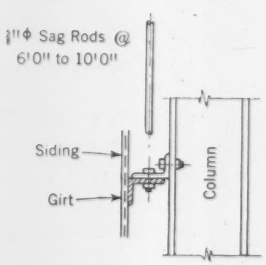


FIG. 1

ROBERT J. WOOD, Assoc. M. ASCE

Decatur, Ill.

Evaluation Is Made of Safety Equation

TO THE EDITOR: Equation 1 in Professor Burmister's letter to the editor, entitled "Factor of Safety in Stability Analyses," in the July issue, belongs to that large category of equations which, because of inertia, persistently escape closer scrutiny. When it was published for the first time several decades ago, it appeared so plausible that it passed on from author to author, as a matter of course.

When preparing his book on *Theoretical Soil Mechanics* (John Wiley and Sons, Inc., 1943), the present writer also expressed the factor of safety by the traditional equation (1). Yet as soon as he read Professor Burmister's letter to the editor, he had to admit that Eq. 3 in his letter serves the practical purpose of the concept of the factor of safety much better than Eq. 1.

KARL TERZAGHI, M. ASCE
Graduate School of Eng.
Harvard University
Cambridge, Mass.

Speakers' Training Urged for Sections

DEAR SIR: In his article, "Technical Tedium or Otherwise," in the July issue, R. W. Crum, M. ASCE, writes as if he had attended other ASCE conventions. Evidently his words were wasted on many of the speakers at the 74th Annual Convention of the Society in Spokane, for it will be admitted by any honest man that some of the papers were poorly prepared and more were very poorly presented. The timing of many was out of all reason, and those chairmen who allowed speakers two or three times their allotted time left themselves open to criticism.

If we are discourteous to speakers or to chairmen in writing thus frankly, we humbly beg forgiveness; we are merely trying to state the consensus of opinion as reflected by remarks heard after the meetings.

At the Wednesday luncheon in the Davenport Hotel, W. Walter Williams, president of Continental, Inc., gave a very thought-provoking address concerning the engineer as a leader of men. The applause was unmistakable evidence

that his message was heartily endorsed by everyone who heard him. Had Mr. Williams stayed on until the Convention drew to its inevitable close, he would have despaired of looking for leaders of men within the group of speakers that we had chosen to hear; for was there ever a leader of men who was not a good speaker? No! And there never will be.

The need for leaders at this crucial time is unquestioned; certain basic qualities of leadership are well recognized, and a means of encouraging development of these qualities is open to the Society. To this end the following proposals are made:

1. The American Society of Civil Engineers assume responsibility for the development of speakers within its own active membership and particularly among the younger men from whose ranks tomorrow's leaders must come.

2. Each Section insure that each younger member is given an opportunity to present at least two papers a year at local meetings of the ASCE, of Chambers of Commerce, of Community Clubs, etc.

3. Each Section appoint a committee to assist the member in the preparation of his paper to insure that his subject matter is well organized, his timing is correct, and his illustrations are visible from the back of the room in which the talk is to be given, and to overcome personality characteristics that might prove detrimental to the delivery.

4. Immediately following each talk at a Section meeting, the membership, led by the chairman, should criticize each of the points in (3) above.

If a program such as that suggested is followed, then each Section of the ASCE should have at least one speaker candidate who could give a talk at the 75th Annual Convention that would be a credit to himself, to his Section, and to his Society. At each succeeding Annual Convention, the quality of the speakers will improve until we can all truthfully say we look forward to the 80th Annual Convention with pleasant anticipation rather than with bored resignation.

CHARLES B. LUSK, JUN. ASCE
and
ALLEN S. CARY, ASSOC. M. ASCE

Seattle, Wash.

Error in Gravitational Measurement Noted

TO THE EDITOR: I am glad to see that the symposium on radar in surveying, in the July issue, came out so well.

However, a small but misleading error was made in my article, "Loran, New Long-Range Aid to Navigation." The gravitational deflections (page 298, col. 3) are measured in seconds of arc, for which I had used the symbol (″). This appeared in print as "in.," which is of course a linear measure. While I doubt that many engineers will be misled, I still wanted to put in your record my observation of this error.

FLETCHER WATSON
Asst. Prof. of Education
Harvard University

Cambridge, Mass.

Definition of Safety Factor Approved

DEAR SIR: In his letter to the editor in the July issue, dealing with the "Factor of Safety in Stability Analyses," Professor Burmister has proposed a new and apparently quite logical definition of the factor of safety of an earth slope against failure by a slide.

The reasonableness of his proposal may, perhaps, be made more evident

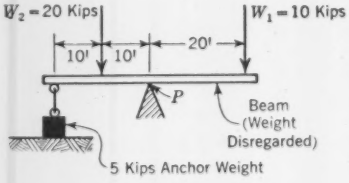


FIG. 1

by a brief discussion of a very simple analogy, illustrated in the accompanying Fig. 1. The factor of safety of the beam against clockwise rotation about point P is, following the proposed definition (as given in Professor Burmister's Eq. 3),

$$FS = \frac{5^{\#} \times 20 \text{ ft} + 20^{\#} \times 10 \text{ ft}}{10^{\#} \times 20 \text{ ft}} = 1.5 \quad \ldots (1)$$

a reasonable result.

In contrast, use of the definition of factor of safety criticized by Professor Burmister (and given in his letter as Eq. 1) results in an absurd answer, since substitution in his Eq. 1 gives:

$$FS = \frac{5^{\#} \times 20 \text{ ft}}{10^{\#} \times 20 \text{ ft} - 20^{\#} \times 10 \text{ ft}} = \infty \quad \ldots (2)$$

While the foregoing example may not provide a perfect analogy to the problem of the safety of an earth slope against sliding, it seems sufficiently similar and relevant to lend confirmation to the proposed definition of factor of safety.

On one very minor point the present writer finds himself in disagreement with Professor Burmister—that is, on the advisability of describing W_2 in his Fig. 1 as a "passive" force. Although W_2 is a stabilizing force, it is nevertheless "active," and no real benefit obtains from a different description.

VICTOR R. BERGMAN, ASSOC. M. ASCE

New York, N.Y.

Solution for Flood Problems Corrected

TO THE EDITOR: After reading my article, "A Graphical Solution for Flood Routing Problems," in the March issue of CIVIL ENGINEERING, I find two places which need correction.

On page 127, left column, line 7 of the second paragraph, which reads ". . .and the length of $F'D$, which is equal to. . ." should read ". . .and the length of $F'E$, which is equal to. . . ." Also on page 127, right column, the line next to the last, now reading "$o = 92\ h^{3/2}$, in cu ft per sec," should read "$o = 79.2\ h^{3/2}$, in. cu ft per sec."

Shanghai, China H. M. CHENG

Meeting Speakers Are Called "Disappointing"

DEAR SIR: I have attended my first convention of the Society, and have returned home with unpleasant memories of the technical sessions. I went to the meetings fully aware of the fact that engineers are notoriously poor speakers. What I didn't expect was that the chairmen of the sessions I attended would allow the poorest of the speakers to continue talking more than twice their allotted time. Perhaps the present chairmen are not entirely to blame; perhaps it is traditional among the older members to allow the various experts in their fields to say all they have to say at these meetings. However, I believe I speak for the majority of at least the younger members when I say that lengthy speeches, with little or no discussion from the floor, defeat the purpose of the meetings.

In a non-technical session, W. Walter Williams challenged the engineering profession to produce leaders in society. Before we can meet that challenge we must train our members to speak for the good of the audience, as effective speaking is a prime requisite to leadership.

I propose that definite steps be taken by the Local Sections—and perhaps by the Society itself—to increase the speaking ability of each individual member. Or is the inertia of the older members too great to overcome?

ADE E. JASKAR, JUN. ASCE

Seattle, Wash.

SOCIETY AFFAIRS

Efficiency in Distributing Transactions Calls for Small Charge, Individual Order

By HARRY F. THOMSON
CHAIRMAN, PUBLICATIONS COMMITTEE

EFFICIENCY in all things is a primary objective of the engineer. The same rule should apply to the activities of ASCE.

For many years our Society has practiced duplication in the distribution of its printed material, as it has furnished all members one copy of technical papers and discussions in the monthly issues of PROCEEDINGS, and the following year a second copy of the same material in the form of bound copies of TRANSACTIONS. Only about 40% of the members have indicated a desire to obtain TRANSACTIONS in permanent form, bound in either cloth or half-Morocco, for which they have paid a nominal charge toward the cost of special binding; the other 60% have received the paper binding without additional charge.

This practice may have appeared justified years ago, when printing costs were much lower than now; but in view of present rising costs and the current paper shortage, it appears indefensible to impose this added burden on the Society. It is doubtful, also, if the Society should be a party to the possible duplication and waste involved in sending paper-bound copies to those who do not particularly desire them. This paper binding represents a repetition in non-permanent form of material previously sent to the same members, most of whom have not kept these volumes for reference purposes. In favor of the use of the paper binding there is this to be said: it provides, even at the new scale of charging, a convenient collection of the best articles on engineering theory and practice, at a most reasonable cost. Where else can the member who desires to keep a convenient record volume of 2,000 pages obtain this quality of engineering literature at such a reasonable price?

At the July meeting of the Board of Direction, the Publications Committee called attention to the present inconsistencies. The Committee recommended that the free distribution of copies of TRANSACTIONS to all members be discontinued, and that, from now on, the distribution be placed entirely on a selective basis, as determined by specific orders from individual members for all bindings at a reasonable schedule of prices. After extended discussion, the Board authorized this change to become effective with the publication of the next, or 1946 TRANSACTIONS.

A CHARGE for ALL volumes of TRANSACTIONS, and the provision that all volumes hereafter must be ordered individually, were approved by the Board of Direction at its Spokane meeting on recommendation of the Publications Committee.

Charges per volume for TRANSACTIONS will be:

Paper binding	$2.00
Cloth binding	$3.00
Half Morocco binding	$4.00

Some of the considerations impelling this change are noted in the accompanying article by Director Harry F. Thomson, chairman of the Committee on Publications. The new policy becomes effective with the 1946 TRANSACTIONS, Vol. 111, expected to be distributed early next year. A charge for the 1921 to 1946 TRANSACTIONS INDEX ordered by members also has been approved by the Board: paper, $1.00; cloth, $2.00; half Morocco, $3.00.

Each member will have the opportunity to indicate whether he wishes to receive TRANSACTIONS, and in what style binding. A special order form now is being prepared at Society Headquarters and will be mailed in ample time to insure its return by the October 10, 1946, deadline, which must be established to facilitate proper billing.

The instructions of each member as to style of binding will be considered a standing order, but subject to revision at any time as he may desire.

This change, which represents a minor reduction in service to members under the current dues rate, is fully justified. The costs of our publications are increasing alarmingly, as we are experiencing the same rising costs as all businesses. The increase in price of $2.00 per copy of TRANSACTIONS for those who need bound copies of papers in addition to the monthly PROCEEDINGS, is nominal only; under the adopted schedule the price of a cloth-bound volume of TRANSACTIONS, containing approximately 2,000 pages, will be only $3.00. Like parking meters and many other items of daily experience, this adjustment is irritating. But the assistance to Society finances, though by no means equalling the increase in cost of our publications in the last two years, will be substantial. And furthermore, the present inefficiency in furnishing two copies of technical papers to members who require only a single copy, will be corrected. The welfare of the Society justifies full support by the membership of the new program.

Cumulative Index to Transactions Planned

IF present plans can be brought to completion in 1947, the Society will make available an up-to-date index to TRANSACTIONS, the first in thirteen years. It will be the sixth index volume to be issued, the sequence being as follows:

PUBLICATION DATE	TRANSACTIONS VOLUMES	NUMBER PAGE
1901	I to XLV	244
1908	XLVI to LIX	110
1912	I to LXXIV	412
1921	I to LXXXIII	272
1934	84 to 99	188
1947	84 to 111	304

It will be noted that the new volume will supersede the 1934 volume and will supplement the 1921 volume. A complete record of all the TRANSACTIONS papers published by the Society, from 1867 to and including papers published in the October 1945 PROCEEDINGS, will be included in two volumes—the 1921 index and the forthcoming 1947 volume.

In the intervening seventy-eight years, a master list of subject headings has been constructed and perfected to a point best calculated to serve the needs of all civil engineers. Each publication date (approximately ten years apart) affords an opportunity to review the master list critically and to make changes and additions in the headings in the light of the most modern needs of the profession. This critical review is already under way at Headquarters.

The purpose of this item is to encourage members everywhere to send in their constructive criticism of our present index topics and to contribute new headings from personal experience in practice. As an aid in this direction, it would have been helpful to reproduce the present master list of index topics for study and discussion. However, this would involve 340 to 400 items—a prohibitive amount of space for the purpose. Engineers in active practice, for whom the importance of this project needs no argument, can refer to the indexes in the past few volumes of TRANSACTIONS as well as to the cumulative indexes in their own libraries, and serve the profession mightily by writing suggestions to the Editor of Technical Publications.

Congress Fails to Enact Science, Pollution Bills

TWO proposed federal laws, in which ASCE members have been interested during the recent session of the 79th Congress, failed of passage before adjournment. They are S.F. 1850, the so-called Science Research Bill, and H.R. 6024, the House Water Pollution Control Bill.

The former proposed creation of a National Science Foundation, and the latter would have given the federal government authority to establish and control the degree of pollution permissible in the streams and rivers of the country.

Sponsors of both bills indicated dissatisfaction with the complications and delays which relegated this important legislation to the last-minute heap so that both bills failed of passage before Congress adjourned. They are confident, however, that both pieces of legislation, perhaps with minor changes, can and will be passed by the next Congress.

Bloom Bill Dies as 79th Congress Ends Session

THE Bloom Bill (H.R. 4982), in which ASCE members and other engineers throughout the country have shown a keen interest, is dead for the time being. It went to its demise when the 79th Congress adjourned. Sustained effort had been made to have the bill amended to eliminate features objectionable to engineers.

Of principal concern to engineers was the provision in the bill which would authorize government agencies "to perform technical services, for the government of another country desirous of obtaining such services, as are within the scope of the established functions." As at least a partial restraint on such broad powers ASCE, among others, was instrumental in prevailing upon the House to adopt the following amendment:

> **"Provided, further, that nothing in this act shall authorize the performance at the expense of the other government of technical services requiring substantial United States staff which private United States firms are competent and available to perform, as determined by the Secretary (of State), unless the Secretary determines it to be in the national interest that such services be performed by this Government."**

The bill was given a place on the Senate Consent Calendar, but when it was called up for action, objection was raised on the floor. Inasmuch as unanimous consent is required to permit action on Consent Calendar bills, the objection was sufficient to block consideration of the bill, and it died.

The Bloom Bill in one form or another is almost certain to come before the next session of Congress. In the interim the opportunity exists for engineers to develop and "sell" to their Congressmen and Senators legislative changes which will provide a better safeguard than that afforded by the hurriedly prepared amendment which passed the House.

100 Votes Separate Candidates on First Ballot in Close Vice-Presidential Race

August 1, 1946

To the Secretary
American Society of Civil Engineers

The tellers appointed to canvass the First Ballot for Official Nominees report as follows:

For Vice-President, Zone II

Gail A. Hathaway	646
Gustav J. Requardt	546
Scattering	32
Void	0
Blank	1
Total	1,225

For Vice-President, Zone III

Ralph B. Wiley	510
Ivan C. Crawford	199
*Ineligible Candidate	79
Scattering	82
Void	2
Blank	8
Total	880

For Director, District 3

Harland C. Woods	119
Louis Mitchell	58
*Ineligible Candidate	14
Scattering	6
Void	3
Blank	0
Total	200

For Director, District 5

Roy W. Crum	180
Wm. H. Richards	90
Scattering	9
Void	0
Blank	0
Total	279

For Director, District 7

Lewis M. Gram	47
Ivan C. Crawford	8
*Ineligible Candidate	22
Scattering	35
Void	0
Blank	17
Total	129

For Director, District 8

C. M. Hathaway	42
S. A. Greeley	35
*Ineligible Candidate	19
Scattering	44
Void	0
Blank	7
Total	147

For Director, District 9

Daniel V. Terrel	101
*Ineligible Candidate	24
Scattering	21
Void	2
Blank	6
Total	162

For Director, District 12

Walden Le Roy Maloney	56
*Ineligible Candidate	28
Scattering	28
Void	0
Blank	0
Total	112

For Director, District 16

D. L. Erickson	152
George S. Knapp	82
*Ineligible Candidate	17
Scattering	11
Void	3
Blank	3
Total	268

Ballots canvassed	3,402
Ballots withheld from canvass:	
From members in arrears of dues	66
Without signature	6
Returned by Post Office	34
Total number of ballots received	3,508

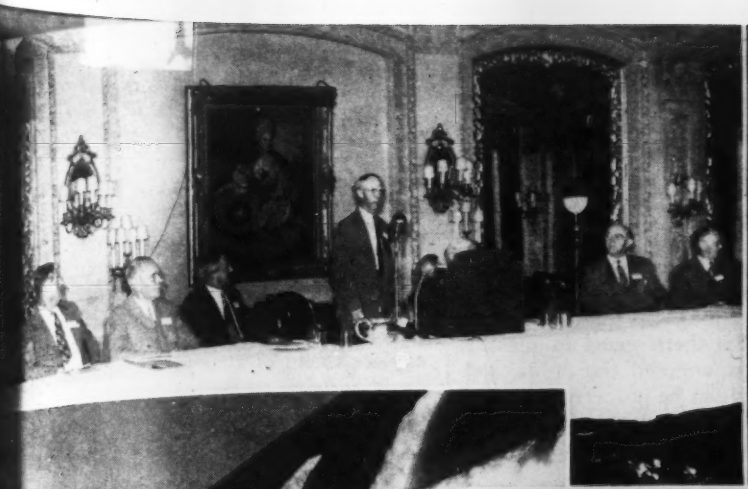
Respectfully submitted,

G. L. FREEMAN, *Chairman*

GEORGE T. GILMAN, *Vice-Chairman*

Albert Di Giacinto	Michael Edward Fiore
Abram Cortland	Howard Holbrooks
H. F. Hormann	R. Edward Kuhn
W. H. Dieck	Francis V. Hayes
Hyman H. Cashdan	George T. Gilman
Norman D. Richardson	J. A. Lenecek
	E. H. Harder

* *These votes were cast for incumbent officers who are presently ineligible for reelection in accordance with Section 5, Article V, of the Constitution.*



(2)

(4)

(5)

(7)

Photographer's View of Spokane Activities

(1) Officers Give Their Attention to Welcome by Harold Doolittle, President of Spokane Section. (2) All Spokane Was Aware of ASCE, Thanks to a Striking Display Dominating the Skyline. (3) Leaders All—President Horner, Frank Banks, and Grand Coulee. (4) Board Session Interrupted for a Picture. (5) "To Make a Long Story Short . . . ," a Lighter Moment as Past-Presidents Stevens, Pirnie, and Black Get Together. (6) "I Worked on That One," Vice-President Howard Tells Director Huie in Pointing Out Hangman's Creek Bridge. (7) A Large ASCE Group on the Grand Coulee Excursion. (8) A Special Radio Broadcast Over Spokane's KGA Featured Top Talent, Three ASCE Officers—Directors Shannon and Tipton and Past-President Stevens. Announcer for Program Was Lloyd Salt. *Photos (4), (5), and (6) Courtesy Spokane Chronicle and Spokane Spokesman Review.*

California Supreme Court Strikes Blow Against Compelling Engineers to Bid

AN ATTEMPT to relegate professional engineering services to the status in which competitive bidding is required has been frustrated by a recent California Supreme Court decision, it is reported by Harold B. Hammill, M. ASCE, president of the Consulting Engineers Association of California.

The decision, rendered upon direct review without the customary procedure of carrying the case through the lower courts, upheld the right of the Director of Public Works of San Francisco and other officials of that city and county to make "contracts for expert and professional services" without resorting to "the procedure of competitive bidding," Mr. Hammill reports. The decision was in the case of Clyde C. Kennedy, M. ASCE, consulting engineer of San Francisco, who brought suit for payment of his fee when, after his work had been completed, an injunction was filed to prevent payment.

In reporting the case, Mr. Hammill points out that "the decision of the seven Supreme Court judges is unanimous, and so sweeping that there seems no question but that the safety and the public welfare of citizens can be properly protected through the employment of engineers qualified to perform the special problems that may arise."

The work performed by Mr. Kennedy was the furnishing of engineering and architectural plans, specifications, and estimates of cost for the construction of the proposed North Point Sewage and Sludge Treatment and Disposal Plant and appurtenant works and buildings to be located in the Islais Creek District, San Francisco. The Consulting Engineers Association of California assisted "in every possible legal manner," Mr. Hammill reports, because it was "deeply interested in the basic principles involved in this matter, as they directly affect the safety and welfare of the public."

N.Y. Sections Seek to Form State Group

MEMBERS of the six Local Sections of ASCE in New York State have been considering the possibility of forming an organization to function on a state-wide basis. On invitation of the Syracuse Section, representatives of these six Sections met in Syracuse on June 22, to consider plans for future unified action in matters of professional relations and legislation. Representatives attending this conference were:

Rochester Section	Col. Carey H. Brown
Buffalo Section	William T. Huber
Ithaca Section	Prof. Frederick J. Spry
	Prof. Marvin Bogema
Syracuse Section	Earl F. O'Brien
	Theodore W. Hunt
Mohawk-Hudson Section	Robert C. Wheeler
Metropolitan Section	D. B. Steinman

Following discussions of common objectives and of the need for cooperation and united action on a state-wide basis, it was decided to recommend the following plan of organization:

That a Joint Committee of ASCE Local Sections in New York State be established, to be constituted of one designated member from each Local Section. This Joint Committee, by one or more meetings a year and by correspondence, is to serve as an instrumentality for conference and for united action in matters of professional relations and legislation.

Earl F. O'Brien, of the Syracuse Section, was elected Provisional Chairman of the Joint Committee.

Tri-City Section First to Sponsor Civic Meet

FIRST use of Society films at an engineer-sponsored meeting of a civic or luncheon club, under the Society's new policy (as announced in the June CIVIL ENGINEERING, page 272) is reported by H. S. Smith, president of the Tri-City Section of the Society.

In a letter expressing appreciation for Headquarters assistance in furnishing films of the Tacoma Narrows Bridge failure for a Section-sponsored meeting of the Muscatine, Iowa, Kiwanis Club, Mr. Smith, under whose direction the meeting was held, provides an outline for similar sessions that might be initiated by Local Sections. Of what amounted to "Engineers' Day" at the Kiwanis club, Mr. Smith writes:

"Prior to showing the film, J. B. Tracy, member of the Society, gave a ten-minute talk on 'A Thumbnail Sketch of the Engineering Profession,' with particular emphasis on the field of civil engineering and its relationship and importance to the welfare of the community. Mr. Tracy pointed out that an engineer's training and background is of such character as to make for an important position in community affairs.

"The film was shown following Mr. Tracy's discussion, with comments by the writer on certain features of the bridge, stressing the fact that this failure had opened up a hitherto relatively unexplored field of structural engineering."

Members Honored by Canal Stamp Issues

BY a strange coincidence, a piece of mail from the Canal Zone, recently received at Society Headquarters, bears three stamps honoring members who were instrumental in the building of the Panama Canal—George W. Goethals, John F. Stevens, and Sydney Bacon Williamson.

General Goethals—whose likeness adorns the 3-cent stamp—succeeded Mr. Stevens as chief engineer on the construction of the Canal. In later years General Goethals generously insisted that the title of "Genius of the Panama Canal" belonged rightly to Mr. Stevens rather than to himself, Mr. Stevens having served during the critical early period of organizing and starting the work. The new 5-cent stamp that honors Mr. Stevens, Past-President and Honorary Member of the Society, is one of many Canal Zone stamp issues honoring him. General Goethals died in 1928, and Mr. Stevens in 1943.

A 30-cent stamp, affixed to the piece of mail, bears the likeness of Mr. Williamson, who was a division engineer on the construction of the Canal. He died in 1938.

Two ASCE Men Discuss Public Works on Radio

Two ASCE members participated in a recent nationwide broadcast of a round-table discussion: "What Shall We do About Public Works?"

E. L. Chandler, Washington representative of ASCE, was moderator on the Sunday program broadcast over the National Broadcoasting Company's network of stations, and Maj. Gen. Philip B. Fleming, Administrator, Federal Works Agency, Washington, was the other Society member participating. The others on the panel were H. E. Foreman, managing director, Associated General Contractors of America, and R. J. Gray, acting chairman, executive committee, Building and Construction Trades Department, American Federation of Labor.

Guided by Mr. Chandler, through the questions he posed, the three other participants in the program presented their views.

What Next in Collective Bargaining?

By T. R. AGG, M. ASCE

IOWA STATE COLLEGE, AMES, IOWA

THE American Society of Civil Engineers early recognized the implications to the engineer of the trend in collective bargaining following the enactment of the National Labor Relations Act and the establishment of administrative policies thereunder. The result of its consideration of this new problem was presented in a report of the Society's Committee on Employment Conditions at the fall meeting of the Board of Direction at Atlanta, Ga., in October 1943. The committee report included the following paragraphs:

"Collective bargaining is with us and will remain indefinitely. There is good reason to believe that the application of collective bargaining will be widened and that in the near future all employees, regardless of occupation, will be forced to adopt collective bargaining group procedures in one form or another.

"If the professionally minded engineer is not prepared to bargain collectively through representatives of his own choosing, collective bargaining will be done for him by representatives selected by an organization with which he may not wish to be identified."

The Board of Direction adopted this report, which recommended among other things that the Society encourage its employee members to inform themselves of steps required to form bargaining units of professional engineers and to form such units if conditions warranted. This dramatic action immediately focused attention upon the implications of collective bargaining to the employee engineer, as was intended.

In the period which has elapsed since that October 1943 meeting, events have moved apace and it is now apparent that the paragraphs quoted above were almost prophetic in their accuracy. Several exhaustive reports on the subject of collective bargaining for engineers have been issued in the intervening years, and Local Sections of the American Society of Civil Engineers, as well as those of other professional societies, have given a great deal of study to this problem as it affects engineers in the areas comprising the sections concerned.

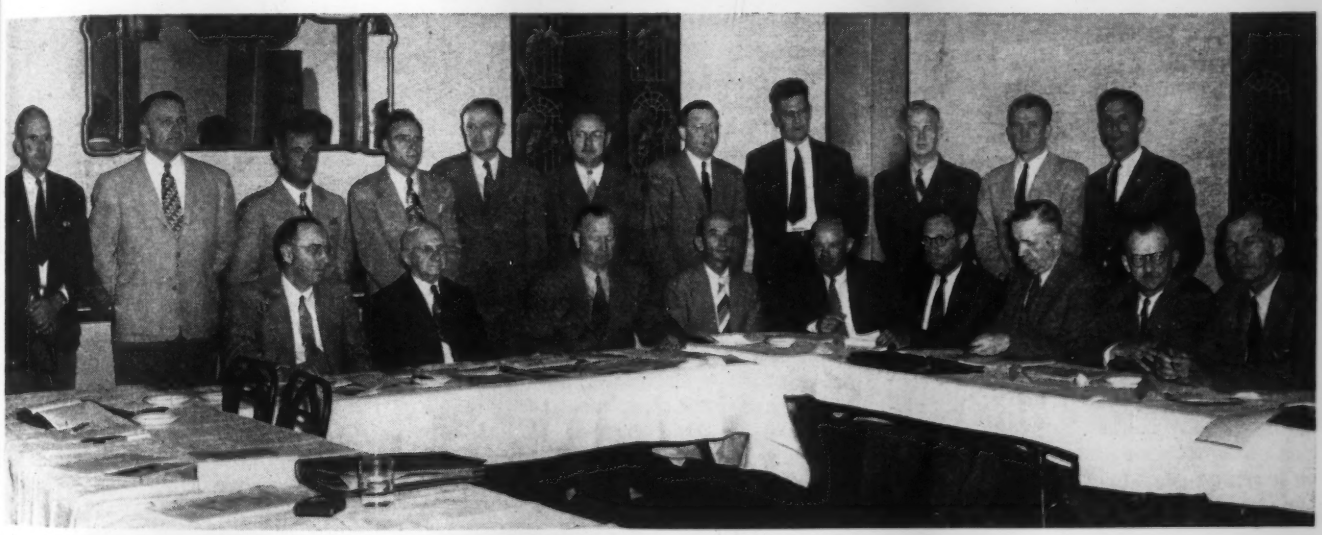
More important still is the experience that has been gained by the professional engineers who have been confronted with the necessity of acting in order to provide for themselves the type of collective bargaining agency they desire. In some instances, professional engineers have affiliated themselves, or been compelled to affiliate, with collective bargaining units of a heterogeneous character, and the results have been most unsatisfactory to the professional engineer.

It is believed that the experiences of the past four years provide data for reaching several exceedingly significant conclusions

Publication of Salary Schedules Is Delayed

SINCE the Board meeting in Spokane in mid-July, it has been found that some important details of the then-approved new ASCE recommended salary schedule for civil engineers remain still to be worked out. The Salary Committee is holding another meeting in late August for the purpose of clarifying its report. Publication of the details of the new salary schedule, as promised in the August issue of CIVIL ENGINEERING, necessarily must be postponed. As soon as the interim schedule and classification has been clarified, details will be published.

The report of the Salary Committee and the action of the Board at Spokane covered an interim situation only. It is the intent of the Committee and the Board that a full review of the question of salaries and classifications for engineers be made at an early date. This will permit final report and Board approval, which will cover the subject more comprehensively than it was covered in the ASCE 1944 schedule, or in the recently adopted interim schedule now in course of clarification.



LOCAL SECTION DELEGATES MEET IN SPOKANE

Here Are the Representatives of the Society's Western Local Sections, as They Considerately Interrupted Their Two-Day Pre-Convention Meeting in Spokane to Pose for This Picture for CIVIL ENGINEERING

Seated left to right: Prof. G. W. Holcomb, Corvallis, Ore., representing the Oregon Section; Fred C. Scobey, Berkeley, Calif., Former Director, who presided; C. S. Heidel, Helena, President, Montana Section; George T. Grove, Tucson, President, Arizona Section; W. G. Bratschi, Santa Fe, President, New Mexico Section; W. A. Hill, Sec'y-Treas., Spokane Section; Theodore P. Dresser, Jr., President, San Francisco Section; C. E. Painter, Salt Lake City, Sec'y, Intermountain Section; R. G. Harding, Salt Lake City, President, Intermountain Section. Standing left to right: Fred H. Rhodes, Seattle Section; E. L. Walsh, Director, Sacramento Section; W. H. Samson, Honolulu, President, Hawaii Section; P. W. Helsley, Vice-President, San Diego Section; F. M. Veatch, President, Tacoma Section; J. E. Warnock, Denver, President, Colorado Section; W. L. Chadwick, President, Los Angeles Section; Walter Johannessen, Phoenix, President, Arizona Section; T. W. Hoff, Seattle Section; M. S. Campbell, President, Seattle Section; and G. K. Ebersole, Helena, Montana Section

with respect to collective bargaining by professional engineers.

1. The possibility that the employed engineer in any organization having 100 or more employees, among which there may be only a half dozen professional engineers, can remain forever aloof from some collective bargaining organization is extremely remote.

2. In several parts of the United States, groups of professional engineers have succeeded in forming collective bargaining organizations acceptable to government administrators and capable of true collective bargaining with employers. These groups provide a pattern which may be utilized by other groups of engineers.

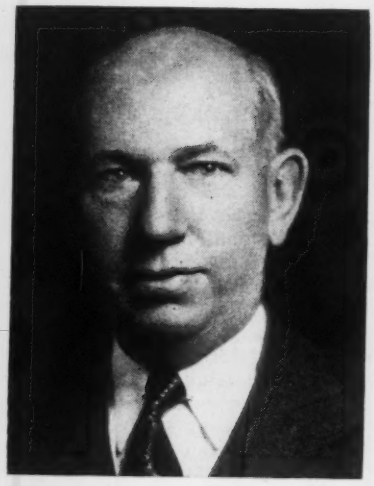
3. Collective bargaining organizations of employee professional engineers must be collective bargaining agencies in fact as well as in name to gain recognition by government agencies.

4. In order to deal with government agencies in connection with collective bargaining, the engineer groups must be prepared to deal with complex and unfamiliar procedures, formalities, and hearings, and to avoid having their cases weakened through the well-known legal technical objection.

5. The experience of professional engineers with collective bargaining has demonstrated that the business involved in such activities requires a large amount of time, entails considerable expense, and frequently involves the employment of legal experts. It is unfortunate, but nevertheless inevitable, that much of the success of a collective bargaining hearing depends upon ability to weave through a maze of technicalities and formalities which have nothing whatever to do with the merits of the case, but are interposed by conflicting interests for the sole purpose of confusing the issue.

These developments are exceedingly important to the employee engineer, and emphasize the tremendous task of providing throughout the country correctly organized bargaining units or agencies to serve the employee professional engineer and prepared to represent him adequately before employers and government agencies. It appears to many who have had close relationships with this problem that the time has arrived for the formation of a national federation of associations of employee professional engineers of such character that it can provide for the engineers in any area the necessary special legal and consulting assistance in dealing with their bargaining problems. Just how such a national agency can be brought into being is not at the moment apparent, but it seems inevitable as the next step along this path to which the employee engineer is committed by the trend of events over which he has little or no control.

Reassignment of Staff Members Brings New Manager and Editor to Civil Engineering



SYDNEY WILMOT

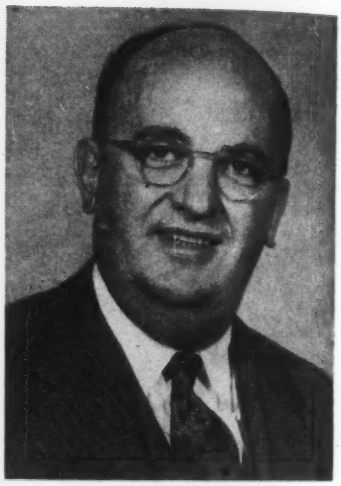
CAPT. CARL E. BEAM

REASSIGNMENT of duties of ASCE staff members, in connection with Society publications, is announced by Col. William N. Carey, Executive Secretary, and becomes effective with this issue of CIVIL ENGINEERING.

Sydney Wilmot, for many years manager of publications, becomes manager of technical publications, and adviser to CIVIL ENGINEERING. Harold T. Larsen remains as editor of technical publications.

C. E. Beam, veteran assistant to the Secretary, assumes the additional duties of manager, CIVIL ENGINEERING; and Allen Wagner, public relations assistant to the Secretary, the additional duties of editor, CIVIL ENGINEERING.

Don P. Reynolds remains as associate editor of CIVIL ENGINEERING, and W. L. Glenzing as advertising manager.



ALLEN WAGNER

Ohio State Students Study Work of ASCE

FROM Don Johnstone, assistant professor of civil engineering at Ohio State University at Columbus, comes word of an interesting project undertaken by students in his class in Contracts, Specifications, and Engineering Relations. An Associate Member of ASCE and former editor of CIVIL ENGINEERING, Professor Johnstone passes along the results of the study with the thought in mind that other civil engineering educators may desire to make use of it.

Five students were assigned to study ASCE activities between 1931 and 1945, each being responsible for reporting on all of the following five phases of Society activities:

Efforts of the Society to improve the economic status of engineers in general through establishment of salary schedules

Efforts of the Society to obtain jobs for individual engineers

Efforts of the Society to extend and enforce the licensing laws

Attitude of the Society toward unionization

Attitude of the Society toward the Federal Program of Public Works

Each of the five students was assigned a three-year portion of the 15-year period covered and had eight hours in the library to complete the task, and the papers were presented to the class with the view of bringing out the professional background acquired by each student during the course of the special assignment.

Name of S.P.E.E. Is Officially Changed

DOUBTLESS in a short time the "American Society for Engineering Education" will sound as familiar to engineers as the old name of the same organization—"Society for the Promotion of Engineering Education," or "S.P.E.E." The ASCE is one of its constituent organizations, and many items about the activities of "S.P.E.E." have appeared in past issues of CIVIL ENGINEERING.

Temporarily it may be a task to remember the new name, "American Society for Engineering Education," which was assumed officially on July 1, but its brevity will commend it.

Engineering Examiners Will Meet in St. Louis

THE Twenty-Fifth Annual Meeting of the National Council of State Boards of Engineering Examiners will be held in St. Louis, Mo., at the Hotel Statler, October 27–29, 1946. At the banquet on Monday night, October 28, one of the principal speakers will be W. W. Horner, president of ASCE. The president of N.C.S.B.E.E., H. P. Person, M. ASCE, will present the Distinguished Service Certificates, and another ASCE member, Maj. Gen. L. J. Sverdrup, will act as toastmaster.

News of Local Sections

Scheduled Meetings

CENTRAL OHIO SECTION—Dinner meeting in Pomerene Hall, Ohio State University, Columbus, September 19, at 6:15 p.m.

GEORGIA SECTION—Luncheon meeting in Davison's Tea Room, Atlanta, September 6, at 12:30 p.m.

OKLAHOMA SECTION—Joint meeting with Mid-South Section at Fort Smith, Ark., September 21 (tentative date). Meeting will be devoted largely to Junior and Student Chapter members.

SACRAMENTO SECTION—Regular luncheon meetings at the Elks Club, Sacramento, every Tuesday at 12 m.

WEST VIRGINIA SECTION—Meeting at the Hotel Frederick, Huntington, September 20. Technical session and business meeting at 3 p.m.; dinner and program of speakers at 6:30 p.m.

Recent Activities

BUFFALO SECTION

The July meeting—consisting of a trip on board the U.S. Dredge *Taylor* operating in Buffalo Harbor—was held jointly with the Buffalo post of the Society of American Military Engineers. Supper was served on board, but because of the limited dining accommodations and the large number of reservations it was necessary to make three trips. The machinery and equipment of the dredge were inspected, after which there was an opportunity to observe its operation in the maintenance dredging of navigation channels, each trip requiring about three hours. The trips—made possible through the courtesy of Col. Herbert D. Vogel, U.S. District Engineer—proved so popular that the Section hopes to make "sidewalk superintending" the regular operations of the Corps of Engineers an annual institution.

DAYTON SECTION

Recently members of the Dayton Section met at the plant of the Price Brothers Company in Dayton for an inspection trip and luncheon. Of special interest to the group was the manufacture of Flexicore Slabs, which are used for floors and roofs and similar concrete items. By the use of conveyors, the steel forms for the slabs are cleaned, greased, and reinforced and then conveyed to the head of the curing vat where the concrete is added and the form intensely vibrated. The slab next enters the steam vat, where it is slowly cured. After it leaves the vat, the forms are removed, and the slab is carried away while the form continues around the conveyor. The complete process requires 24 hours.

HAWAII SECTION

Details of the damage to the Hilo breakwater caused by the April 1 tidal wave were discussed at a recent meeting of the Section by Ben E. Nutter, field engineer for the U.S. Engineer Office at Honolulu. Dr. Francis P. Shepard, of the Scripps Institution of Oceanography at La Jolla, Calif., was also present and spoke on the characteristics of tidal waves in general. Dr. Shepard is one of a group of geologists sent to Hawaii to make on-the-spot investigations of the disastrous April 1 disturbance.

LOUISIANA SECTION

Numerous business matters were discussed at the July 29 meeting, and announcement was made of the Section's annual award of Junior memberships in the Society. This year the recipients are Robert O'Malley Pruyn, of Louisiana State University, and Salvatore Charles Moschella, of Tulane University. Announcement was also made of the Section's special annual scholarship awards for the school year 1946–1947. One of these, having a value of $125, goes to Frank M. Heroy, Jr., of New Orleans, a student at Tulane; and the other, which is valued at $40, to Richard W. Couvillion, of Marksville, La., a student at Louisiana State University. The technical program for the occasion consisted of an illustrated talk on the port of New Orleans, which was given by John A. McNiven, chief engineer of the Board of Commissioners, Port of New Orleans. A general discussion of Mr. McNiven's talk concluded the meeting.

MIAMI SECTION

The Miami Section concluded its year's activities with a talk by Col. Lynn Perry on the formation and organization of an engineer regiment during the war. Colonel Perry covered the training, outfitting, transportation, and establishment of his regiment, which was engaged in the Aleutian campaign. From his base at Adak, Colonel Perry was active in the preparation for the assault on Attu and Kiska and was able to give a very informative account of that part of the war against the Japanese.

OKLAHOMA SECTION

The importance of safety engineering was stressed at the July meeting of the Section, the principal speaker being Dr. DeWitt Hunt, head of the department of industrial arts education and engineering shopwork at the Oklahoma Agricultural and Mechanical College. The group then studied "Accidents in Oklahoma in 1944," a publication of the Oklahoma Engineering Experiment Station. Part of the session was devoted to business discussion and to making plans for a joint meeting with the Mid-South Section, which is to be held at Fort Smith, Ark., in September.

PANAMA SECTION

Principal speaker and guest of honor at a recent meeting of the Panama Section was Franklin P. Ulrich, seismological representative of the U.S. Coast and Geodetic Survey, who has been in the Canal Zone lately in connection with the Survey's special American Republic Program. Mr. Ulrich presented a paper on the subject, "Recent Developments in Engineering Seismology."

SACRAMENTO SECTION

Members of the Sacramento Section heard about the Sacramento Deep Water Channel on July 16, when Francis G. Christian, principal engineer for the local U.S. Engineer Office, described the physical and economic aspects of the project as proposed by the Corps of Engineers. This report was of special interest because the project is now authorized, and the city of Sacramento has to decide whether to go ahead with its share of the cost. Society Director Frederick W. Panhorst and E. L. Walsh, former president of the Section, attended another of the July luncheon meetings and reported the Spokane Convention. The group expressed much interest in recent activities of the Board of Direction, as described by Mr. Panhorst, and in Mr. Walsh's account of the Local Section Conference.

TACOMA SECTION

An inspection trip to the Second Nisqually Power Development, located approximately 35 miles southeast of Tacoma, constituted a recent regular meeting of the Section. Meeting at the Alder Dam site, the group was shown the dam and taken through the power house below. A visit to the La Grande Dam and power house downstream followed. Guides for the tour were O. A. Anderson, J. A. Arntson, and Verne Gongwer, who pointed out the interesting features of the project and answered the members' questions. Alder Dam will have an ultimate output of 50,000 kva, and La Grande Dam of 64,000 kva.

TENNESSEE VALLEY SECTION

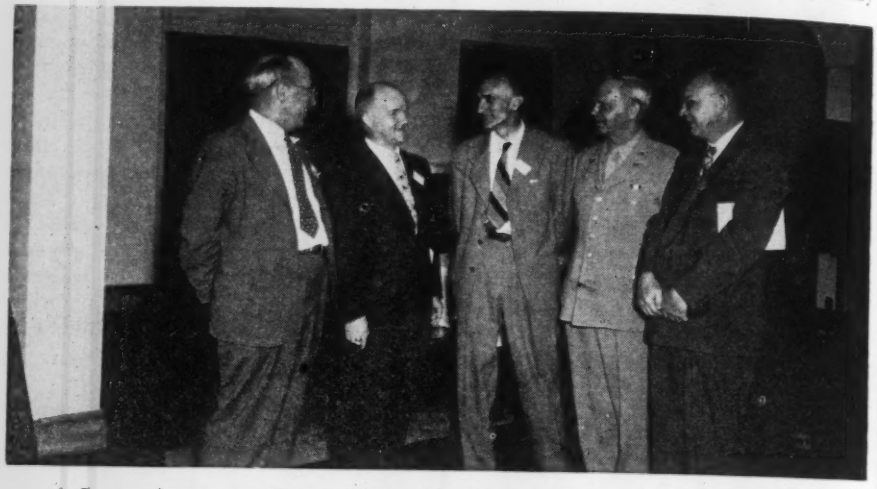
The work of the Knoxville Technical Society and the Knoxville Joint Council of Technical Organizations was described be Prof. A. T. Granger at a recent meeting of the Knoxville Sub-Section. The principal speaker was Fred C. Schlemmer, who discussed his recent trip to India, where he and Ross M. Riegel went as consultants to the Indian Government on the water resources of the country.

TEXAS SECTION

Speaking before the July meeting of the Fort Worth Branch of the Section, S. R. Sapirie commented on the causes of failure in dam spillways and described current methods of redesign and repair that will ensure a safe structure. Mr. Sapirie, who is regional engineer for the Soil Conservation Service at Fort Worth, illustrated his talk with lantern slides. At the close of the meeting the gavel was handed to Henry Rockwood, incoming president. J. R. Hendrick is the new secretary-treasurer of the Branch.

VIRGINIA SECTION

The Virginia Section recently held a two-day joint meeting at Norfolk, the participating groups being local branches of the Founder Societies, the American Institute of Architects, the American Chemical Society, and the Society of American Military Engineers, and the Engineers Club of the Virginia Peninsula and the Engineers Club of Hampton Roads. The list of speakers included J. Elmer Housley, newly elected president of the American Institute of Electrical Engineers, whose subject was "Present-Day Problems of Engineering Societies", Hal H. Hale, secretary of the American Association of State Highway Officials, who discussed the Inter-American Highway; and Col. E. E. Gesler, division engineer for the Middle Atlantic Division of the Army, who spoke on "The Military Engineer's Place in the Peacetime Program." Special events of the two-day session were a dinner dance and trip to the U.S. Naval Air Station.



A GROUP ATTENDING RECENT JOINT MEETING OF THE VIRGINIA SECTION POSES FOR A PHOTOGRAPH

Left to right: Henry H. George, 3rd, Acting City Manager of Norfolk; D. E. Donley, Secretary, Hampton Roads Post, S.A.M.E.; Prof. R. A. Marr, President, Virginia Section, ASCE; Col. E. E. Gesler, Division Engineer, Middle Atlantic Division; and Hal H. Hale, Secretary, American Association of State Highway Officials

Student Chapter Notes

STANFORD UNIVERSITY

Organized on a semi-official basis for the summer quarter, the Stanford University Chapter held a combined business and social meeting on July 17. A talk on developments in the electrical engineering field comprised the technical program for the occasion, the speaker being Dr. Leonard F. Fuller, acting professor in charge of Navy-sponsored research in electrical engineering at Stanford. On another occasion, members of the Chapter visited the East Bay properties of the San Francisco Water Department, including Calaveras Dam, and the purification plant, valve house, and tunnels.

UNIVERSITY OF CALIFORNIA

Guest of honor and speaker at a recent meeting of the University of California Chapter was R. Robinson Rowe, senior bridge engineer for the State Division of Highways at Sacramento. Mr. Rowe, who confounds the mathematicians in his monthly column in CIVIL ENGINEERING, discussed the subject, "Mathematics for Engineers." Following his talk, the new officers for the fall semester spoke briefly on prospects for the coming term. The new officers are: Philip Auchard, president; Merrill W. Bird, vice-president; Clive E. Genner, secretary; and Robert M. Duncan, treasurer.

UNIVERSITY OF ILLINOIS

The University of Illinois Chapter reports a highly successful July meeting. Approximately ninety persons were on hand to hear Prof. Thomas C. Shedd discuss the Illinois Professional Engineering Act and Prof. Harold E. Babbitt talk on professional engineering societies. The meeting proved so successful that fourteen new Chapter members were signed during the evening.

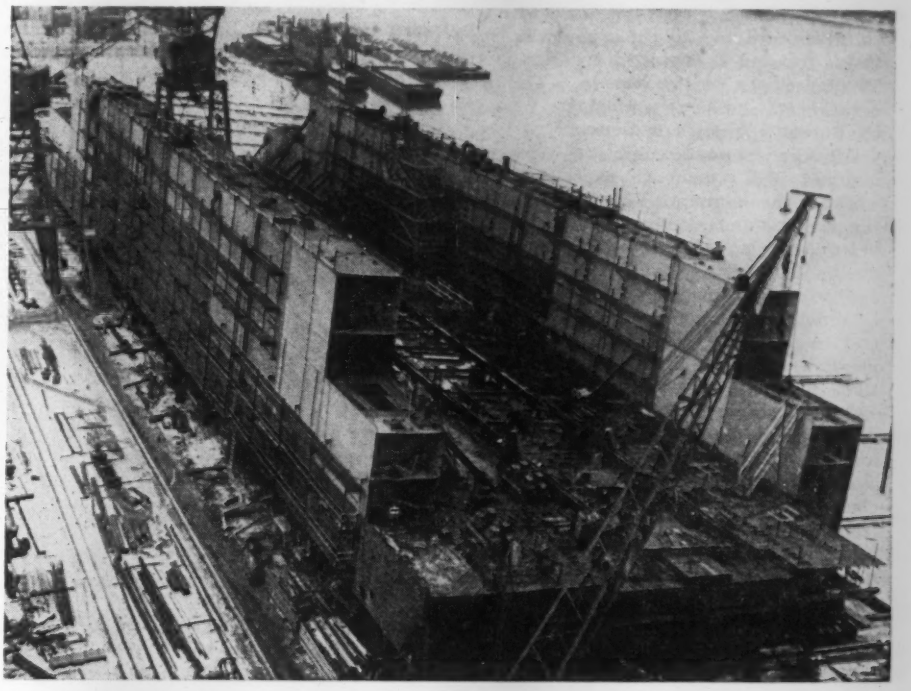
About Engineers and Engineering

Navy Launches, Tests Largest Drydock Ever Built on Inland River

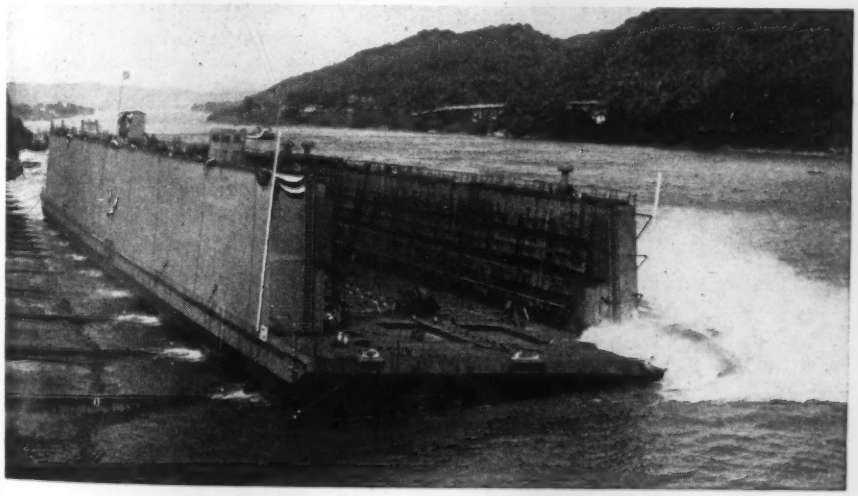
LARGEST VESSEL ever to be built on the inland rivers of America, the Navy's floating drydock ARD-33, was launched in the Ohio River on August 10. The dock was built under the supervision of the Bureau of Yards and Docks by the Dravo Corporation at its Neville Island Yards at Pittsburgh, Pa. With its lifting capacity of 6,000 tons, it will be able to serve cargo ships of "Liberty" size and auxiliary Navy ships.

The structure of the floating dock is butt welded throughout. In erecting ARD-33, the Dravo Corporation used its usual method of fabricating subassemblies in shop and platen areas. These subassemblies were moved to the building ways as required, via railroad flat car, positioned, and welded to adjoining sections. Welding techniques were developed in cooperation with the Navy's Bureau of Yards and Docks. Automatic welding played an important part in the shop fabrication of the subassemblies. Scaffolding was welded to the side walls to facilitate erection.

This ship-lifting giant is 448 ft long by 97 ft wide and 45 ft high.



DURING ERECTION OF ARD-33, SCAFFOLDING WAS WELDED TO SIDE WALLS



TO ELIMINATE LAUNCHING STRESSES, THE FLOATING DOCK WAS ERECTED PARALLEL TO SLOPING WAYS

Because of its size, ARD-33 could not be launched in the conventional manner. To avoid excessive stresses that might occur at launching, the flat bottom of the dock was erected parallel to the sloping ways—which meant building the vessel on a slope—in this instance at an angle of $1\frac{1}{2}$ in. in 12 in. As soon as the well deck was assembled, a full-revolving rail-mounted traveling crane was placed in the well, to facilitate erection of wing walls and placing of machinery.

Getting the crane aboard the vessel was an engineering job of its own, since the crane weighed 135 tons. The crane was raised 22 ft by means of eight 50-ton jacks, and at that height was transferred to rails laid on wood cribbing. These rails were joined to those already laid on the well deck, and the crane moved aboard under its own power. It was removed before launching by reversing the procedure, with the exception of the use of jacks. Coming off, the crane rode down inclined rails to the ground level.

The drydock will undergo submergence tests before leaving the Dravo plant. Since the usual depth of the Ohio River in the Pittsburgh vicinity is about 16 ft in the deepest pools, it was obvious that the dock, in submerging, would rest on the river bottom before it could reach its test depth. The U.S. Army Engineers supplied the answer. They "dug a hole" in the river bottom, just above the Montgomery Dam near Rochester, Pa., and there will be 45 ft of water in the "hole"—ample for testing ARD-33. The "hole" is 500 ft long and 150 ft wide.

The ARD-33 was sponsored by Mrs. Ben Moreell of Washington, D.C., wife of Admiral Ben Moreell, Hon. M. ASCE. When completely outfitted and tested, the huge dock will be towed 2,000 miles down the Ohio and Mississippi rivers.

How to Avoid Construction Mishaps Told in New Book

"How Can Accidents Be Prevented?" is the main thesis of *Surface Construction Without Accidents*, an 84-page book written for the contractor and recently published by the American Mutual Liability Insurance Company. The term, "surface construction," is applicable to jobs ranging from the building of a highway to the grading and surfacing of an airport. Many illustrations increase the interest and usefulness of the volume, which is one of the continuing series of works on the prevention of accidents in the construction industry published by American Mutual.

Construction contractors and others interested may obtain copies of *Surface Construction Without Accidents* by writing the American Mutual Liability Insurance Company, 142 Berkeley St., Boston 16, Mass.

Reclamation Bureau Trains Young Chinese Engineers

NINETEEN young Chinese engineers were honored by the Bureau of Reclamation on July 26 when they were presented with certificates testifying to the completion of a year's training in engineering design in the Denver offices of the Bureau. The presentation was made at a luncheon tendered by Bureau engineers at Denver.

All the Chinese engineers who were honored will remain to assist in design work for the mammoth Yangtze Gorge project, a spectacular billion-dollar river development planned by the Chinese government. They first went to Denver a year ago to work alongside Bureau engineers in order to assimilate American methods and construction practices in the development of water resources. It was reported that during the past year approximately 140 engineers from 24 nations in all parts of the globe had visited the Denver offices and laboratories.

Approximately 150 present at the luncheon heard W. E. Corfitzen, a Bureau official from Washington, explain that the Bureau had made its facilities available at the request of the State Department and that all costs for training the engineers is borne by their respective governments.

Chief Engineer Walker R. Young, who presented the honor certificates, emphasized the tremendous job of construction facing the Chinese engineers when they return to their homeland and the great opportunity they will have to build a greater China. Other speakers included Assistant Chief Engineers L. N McClellan and W. H. Nalder; Consulting Engineer John L. Savage; E. L. Barrett; S. P. Wing, chairman of the luncheon; and Sydney Wilmot, Manager of Technical Publications, who was returning from the Spokane Convention and who represented the Society.

Expressing the gratitude of the Chinese group for the help of the United States Government, Chung-yu Pan congratulated the Bureau on having become "the international center of advanced engineering education." The entire luncheon, like the earlier event at which these Chinese graduates entertained the Bureau engineers at the outset of their American studies, was characterized by cordiality, mutual appreciation, and recognition of reciprocal courtesies.

Pittsburgh Planners Issue Postwar Progress Report

BELIEVING that progress made to date in its postwar planning should be available to interested citizens, the Pittsburgh (Pa.) City Planning Commission has issued a 184-page progress report, "Pittsburgh—Groundwork and Inventory for the Master Plan."

Unlike previous reports on Pittsburgh's planning, this undertakes to give a comprehensive picture of the background and major relationship involved.

Those interested in the report should get in touch with the City Planning Commission, Department of City Planning, Pittsburgh, Pa.

N. G. Neare's Column

Conducted by

R. ROBINSON ROWE, M. ASCE

THE dinner topic was *mirrors*. Usually the Engineers Club was courteous enuf to wait for the Professor to liquidate his second coffee before discussing the problem, but there was a gal named "Toots" in this one and her beaus were looking at each other's feet in the mirror. The matter was urgent.

"At Siwash Poly," recalled Amos Keatow, "Prof. Ettik taught us that you couldn't see your feet by backing away from a mirror. If you could just see your knees when close to the glass, then you could just see your knees from the far side of the room."

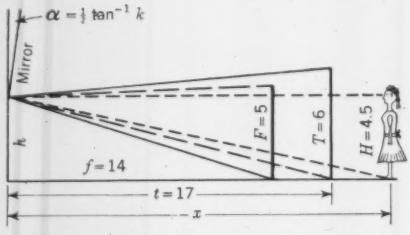


FIG. 1. TOOTS BEHIND THE BOYS

"They taught the same thing at Miss-Tech," agreed Joe Kerr. The boys must have been looking skew-wise in the mirror to just see each other's feet, but if Toots could see her tootsies at all, she could be anywhere."

"They must have perfect mirrors at Siwash and Miss-Tech," said Cal Klater. "This mirror was 'hung on the wall,' so it wasn't vertical. The height h of the bottom on the mirror can be found from the quadratic

$$(tT - fF)h^2 - FT(t - f)h - ft(Ft - fT) = 0 \quad \ldots\ldots(1)$$

where f, t, F, and T are the given dimensions in Fig. 1. We find $h = 4.47464$ and -1.66214 ft.

"Then we can find the deviation of the mirror from

$$k = \tan 2\alpha = \frac{h(f + t) - fT}{ft + h(T - h)} = 0.223476 \quad \ldots\ldots(2)$$

and the required distance x from the quadratic

$$kx^2 - (2h - H)x + hk(H - h) = 0 \quad \ldots(3)$$

"I found $x = 19.903$ and $x = 0.0057$, but I rejected the latter because Toots' nose would keep her eyes farther than that from the mirror."

"I needn't have come tonight," remarked the Professor. "Cal's told you the answer without any coaxing, altho rigor demands some qualification of the interference of Toots' nose. Plot that solution on a large scale and you'll find that the tip of her nose is below the mirror; unless she has a Roman nose, it's her forehead that interferes.

"Then, Cal, if you can tell why you discarded the negative value of h, we're done."

"I didn't want to discard it, Noah. The mirror could have been on a stairway below the floor level, with Toots in front of Tippy and holding hands with Flat at the head of the stairs. But Flat would have been looking thru the top step to see Tippy's toes!"

"Good enuf, Cal. Our next can be solved with dice: Thru how many points selected at random can a cube be drawn and how many cubes can be drawn thru that set of points? To make the question clear, we'll have to define a cube in a broad sense to include all the extensions of the 6 planes forming the faces of the cube and to require that each of the points be in one of those planes."

[Cal Klaters were: Anne Othernut (J. Charles Rathbun), Isidore Knobbe (Joseph S. Lambie), John H. Bliss, A. Skrew Basel (Karl V. Steinbrugge), and A. L. Kolom (Sidney J. Jennings). Kolom also sent a good solution to the June problem that just missed our deadline.]

A.I.E.E. Elects Officers for Year Beginning August 1

NEW officers of A.I.E.E. elected for the year beginning August 1 were announced at the annual meeting of the Institute held June 26. These are:

President, J. Elmer Housley, District Power Manager, Aluminum Company of America, Alcoa, Tenn.

Vice-Presidents, E. W. Davis, Cambridge, Mass.; O. E. Buckley, New York, N.Y.; T. G. LeClair, Chicago, Ill.; R. F. Danner, Oklahoma City, Okla.; C. F. Terrell, Seattle, Wash.

Directors, J. F. Fairman, New York, N.Y.; R. T. Henry, Buffalo, N.Y.; E. P. Yerkes, Philadelphia, Pa.

Treasurer, W. I. Slichter, Schenectady, N.Y. (reelected).

These officers, with the holdover officers from the previous year, constitute the board of directors of the Institute.

Atlas Hydroélectrique de France Is Published

UNDER the general title, *Atlas Hydroélectrique de France*, a comprehensive volume listing the hydroelectric projects in France has recently been issued. It was published under the auspices of the Chambre Syndicale des Forces Hydrauliques and edited with the assistance of the Société Hydrotechnique de France.

Many statistics are included. There are also general and detailed maps covering the whole of France, indicating dams, power lines, and accessories. Another large section covers the profiles of the streams involved. Finally the individual plants are described in some detail, with plans and cross sections of structures and some excellent views of the projects both under construction and completed.

This large volume has been placed on file in the Engineering Societies Library, where it should serve a useful purpose in affording American engineers a most complete picture of French hydroelectric installations. It is written in French and the data are in metric units. This atlas should prove a most valuable addition to the available information on hydroelectric developments in France.

Model Tests Conducted for Mt. Morris Spillway

WHAT seems to be a unique form of stilling basin has been developed as a result of extensive model tests performed under the direction of Prof. George E. Barnes as consultant for the U.S. Engineer Corps. The tests were performed at the Warner Hydraulic Laboratories of the Case School of Applied Science. A recent report covers work on two sets of models—one to a 1.64 scale and a later set on a 1.100 scale.

Because the gorge below the spillway for the Mount Morris Dam, on the Genesee River at Mount Morris, N.Y., is rather narrow, it was necessary to utilize sloping training walls, which created objectionable conditions of disturbance at the lower corners of the spillway. The report indicates the solution of this difficulty "by stripping the flow along the edge of the spillway face by means of long radius fillets which direct it forward along horizontal steps running along the face of the training wall." The hydraulic conditions resulting were found to be most favorable of all the stilling basins tested.

The present report has been deposited in the Engineering Societies Library at Headquarters for general study by interested members. It consists of about 30 pages of descriptive text, 134 folding charts, giving model details of test data, and some 20 photographs of the test work.

Highway Research Board Will Meet in Washington

THE Highway Research Board will hold its Twenty-Sixth Annual Meeting in the building of the National Academy of Sciences and the National Research Council, Washington, D.C. The date is December 5 through 8.

Vancouver (Wash.) Prepares for Industrial Expansion

THE MANY civic potentialities of the city of Vancouver, Wash., at the mouth of the Columbia River, are emphasized in an ambitious report that has been prepared by the City Planning Commission for 1945. The city is apparently ideally located for commercial and industrial expansion. It is also in the climatic zone conceded by economic geographers to be best for human health and efficiency.

This 89-page report presents in interesting form data assembled during the past year by the staff and several committees appointed by the City Planning Commission on special subjects, such as land use, transportation, recreation education, community health and welfare, industry, commerce and labor, and population. The complete set of maps is intended to portray important conditions and trends, but an interesting supporting narrative increases the value of the report.

Inquiries regarding the report should be addressed to the City Planning Commission, Vancouver, Clark County, Wash.

Army's New Research Unit Head Asks Engineers' Aid

AMERICAN engineers and scientists are being counted on to help "organize a research and engineering team of civilian and military personnel whose material and social accomplishments will guarantee to our country the security and freedom from fear so necessary to the future existence of the American way of life."

MAJ. GEN. HENRY S. AURAND

Major General Henry S. Aurand, director of the newly created Research and Development Division of the War Department General Staff, told this to more than 750 persons attending the annual meeting of the Los Angeles Engineering Council of Founder Societies in the Biltmore Hotel, Los Angeles, July 26. It was General Aurand's first address after assuming his new duties.

Outlining the Army's policies to insure civilian influence in development and procurement activities, as well as in long-term planning for national defense, General Aurand paid tribute to American engineers and scientists, whom he called "the primary research and development asset of the nation, both in peace and in war."

Approval of UNESCO by U.S. Spurs Organization

INTEREST of ASCE members and other engineers in the free exchange of scientific and educational data between nations was given impetus by enactment of a Joint Resolution in the closing days of the 79th Congress, authorizing President Truman to accept membership in the United Nations Educational, Scientific and Cultural Organization (UNESCO). Engineers Joint Council has been interested in this organization since it was proposed at the San Francisco conference in April 1945.

An informal advisory committee of scientists has been assisting the State Department for some months in connection with the department's Preparatory Commission work, and it is expected that the engineering profession will be represented among the one hundred members of this country's National Commission on Educational, Scientific and Cultural Cooperation, which the Joint Resolution authorizes. Sixty members are to be selected by each of sixty national organizations interested in education, science and cultural matters, and forty will be chosen by the State Department.

The status of the United States as to approval of UNESCO now is identical with that of Brazil, China, Denmark, Egypt, Iran, Norway, Syria and Turkey; that is, the organization has been approved and these countries now await only the final action of depositing the acceptance. Nine countries already have accepted the organization and have deposited their acceptances. These are: Australia, Dominican Republic, France, India, Mexico, New Zealand, Saudi Arabia, Union of South Africa, and the United Kingdom.

Full acceptance and ratification of twenty of the original 43 signatories is required before operation of UNESCO can begin. Such ratification is expected soon, and a general conference has been scheduled for November in Paris, which is to be the headquarters.

UNESCO's constitution states that the organization is to be "dedicated to the proposition that the free and unrestricted education of the peoples of the world, and the free and unrestricted exchange among them of ideas and knowledge are essential to the advancement of human welfare and to the preservation of security and peace." The organization will "recommend such international agreements as may be necessary to promote the free flow of ideas among nations and to aid the member nations, at their request, to advance the ideal of equality of educational opportunity by suggesting educational methods best suited to this end."

California Highways Need Engineering Personnel

WITH a $123,000,000 postwar state highway construction program on its hands, the Division of Highways of the California Department of Public Works is urgently in need of from three hundred to five hundred young road engineers.

The need is so great that State Highway Engineer George T. McCoy, M. ASCE, is advertising for graduate civil engineers to enter state service. During the war more than three hundred engineers of the Division of Highways entered the armed services. Many of these have returned, but the expanding postwar highway building program requires additional engineers in all the eleven highway districts.

Positions available range from junior engineers to associate highway engineers. Starting salaries vary from $230 to $355 a month.

District highway engineers have launched $46,728,300 worth of postwar projects set up in the initial part of the California Highway Commission's three-year program. The second part of the program starts in July. In the eleven highway districts there is a serious shortage of engineering personnel. Inquiries should be addressed to George T. McCoy, State Highway Engineer, State Department of Public Works, Sacramento, Calif.

California Tech Reports on Handicapped as Workers

A TIMELY pamphlet, entitled "The Physically Handicapped Worker in Industry," was recently issued by the California Institute of Technology. The 54-page booklet consists of an investigation into the effectiveness of the physically handicapped employees of Lockheed Aircraft Corporation in Burbank, Calif.

Most employers have considered the physically handicapped to be unemployable. Thus the experience of the Lockheed Corporation, which has successfully employed several thousand of them, is of special interest. A case study of 1,815 employees was made, and it was the aim of the study to determine as objectively as possible the characteristics of Lockheed's physically handicapped population, their job performance, absences, accidents, and morale in comparison with a group of physically normal employees selected at random.

The study has been issued as Bulletin No. 13 of the California Institute of Technology's Industrial Relations Section. It may be purchased for $2 at the Bookstore, California Institute of Technology, Pasadena 4, Calif.

Richmond City Planning Commission Makes Report

AMONG the many forward-looking plans for city development, that recently issued by the City Planning Commission of Richmond, Va., deserves special mention. It comprises a most comprehensive and careful study and forecast of the needs of a metropolitan area. Historical background, population trends, housing, transportation, recreational facilities, civic center development, are all covered in considerable detail. Fifty or more tabulations and almost a hundred large charts and graphs supplement this study.

The whole comprises a noteworthy attempt to dramatize the needs and opportunities of Richmond. A number of Society members have served in developing this fine report, including E. M. Hastings, who acted as chairman of the Commission for a number of years, and the firm of Harland Bartholomew, which served as consultants and technical experts. This 280-page report will be found on file in the Society's Reading Room and also in the Engineering Societies Library. It will repay study on the part of those interested in civic and district planning.

Volunteer Training Program Open to Peacetime Seabees

A TRAINING program for a peacetime volunteer organization of former Seabees and their Civil Engineer Corps officers has been planned by the Bureau of Yards and Docks in conjunction with the Bureau of Naval Personnel. The organization, which will be open to inactive reserve members of the CEC and Seabee veterans only, is expected to provide the Corps with a pool of competent practicing professional engineers, and of enlisted men competent in some division of the construction or related industries.

Available for quick mobilization in time of emergency, the organization will be large enough to meet all engineering and construction needs of the Navy not covered by the Regular Corps of other Engineer specialists units.

Seminar courses will enable members to improve their technical ability and general knowledge of Navy needs and problems. Also, those who participate fully in the program will be available for immediate mobilization in an emergency without further training. Veterans may, however, join on a partial participation basis if they desire. If at a later date the law permits, new enlistees also will be permitted to join.

Besides the seminar courses, which will consist of ten monthly meetings each, extension courses will be given on miscellaneous subjects. These will be optional to all members, except for the courses in Navy Regulations and Military Law. Future training courses afloat, tours of Naval shore establishments, and courses at Command, Staff, and Service Schools are also being considered.

The Reserve Component will be divided into geographical units, with fifteen members the minimum for a unit. Each area will be supervised by a Civil Engineer Corps officer who will be responsible to the District Commandant for the operation, training, and maintenance of the organization.

Any Seabee or Reserve Civil Engineer Corps officer desiring further information should contact the Director of Naval Reserve in his District, or Capt. C. Ken Weidner, Room 2804, Arlington Annex, Washington 25, D.C.

Freeman Library Books Sent to China by EJC

MORE than 4,000 items of engineering literature from the library of the late John Ripley Freeman, Past-President and Honorary Member of the Society, are on their way to Nanking, China, according to an announcement by Stewart E. Reimel, secretary to the Committee on International Relations of the Engineers Joint Council.

The books, periodicals, and documents, weighing almost two tons, were published between 1889 and 1932 and represent about one-half of Mr. Freeman's collection. They were made available by the Engineering Societies Library and were accepted on behalf of the Nanking Library of the National Resources Commission of China by Dr. C. D. Shiah, chemical engineer and technical representative of the commission in the United States.

The shipment was arranged by the American Society of Mechanical Engineers acting for the EJC Committee on International Relations as part of the Council's program for restocking war-devastated libraries. The gift is the largest contribution of technical literature so far made to the campaign.

Mr. Freeman, who died in 1932, spent more than five years as consulting engineer to the Chinese Government.

New in Education

Cornell Institutes Five-Year Engineering Physics Course

ONE of the nation's first schools of engineering physics, with a five-year curriculum, will be opened at Cornell University in September. To be known as the Department of Engineering Physics, the new division is designed to help meet industry's demand for men with broad training to engage in the increasingly important work of industrial research and development.

According to Dean S. C. Hollister, M. ASCE, of the College of Engineering, through which the new department will be administered, it "will bridge the area lying between the training in basic science and in fundamental engineering." The degree, Bachelor of Engineering Physics, will be awarded on completion of the five-year curriculum, and graduate work will be offered through the Graduate School of the university.

Students will have wide latitude in selecting specialties within the engineering physics curriculum, such as atomic physics, X-rays and crystal structure, optics, spectroscopy, electronics and ionics, ultra high frequencies, wave propagation, communications, properties of materials, engineering electronics, electronic properties of solids, elasticity and stress analysis, aerodynamics.

Reports on Loran Obtainable from Commerce Department

A NON-TECHNICAL report on the loran system of hyperbolic navigation and another on the future of such hyperbolic systems have been removed from the "secret" category and are now on sale by the Office of Technical Services, Department of Commerce. The reports were written primarily for readers without technical training in electronics.

Elements of Loran, prepared by B. W. Sitterly at the Radiation Laboratory of the Massachusetts Institute of Technology, is a general exposition of the principles of the loran system (PB-25369; photostat, $4; microfilm, 50 cents; 45 pages, including diagrams, charts, and graphs). It explains what loran is, how it works, what its limitations are, and why the system is laid out and operated the way it is.

The Future of Hyperbolic Navigation was prepared by J. A. Pierce, formerly with the M.I.T. Radiation Laboratory and now with Harvard University (PB-2834; photostat, $2; microfilm, 50 cents; 23 pages). Three hyperbolic navigational systems are described and evaluated in the report; the famous British Gee system, which made the bombing of Germany so effective; the loran system, including standard, skywave synchronized, and low-frequency loran; and the British Admiralty's decca system.

Orders for the reports should be addressed to the Office of Technical Services, Department of Commerce, Washington 25, D.C., and should be accompanied by check or money order, payable to the Treasurer of the United States.

Film on "Clean Waters" Boosts Stream Purification

AN EDUCATIONAL film of superior quality has just been released under the title of "Clean Waters." Although arranged with a popular appeal, it has more than a little of engineering interest.

The theme is the value of sanitary water supply for the welfare of the country. Recreational, wild life (sea food and game), and health values are emphasized, all by means of splendid color views and sound accompaniment. The engineering feature consists of animated graphs indicating the processes of sewage purification, together with views of modern treatment plants.

In particular the film is characterized by good taste. It points out the present sacrifice of $100,000,000 annually because of unsanitary conditions, and the immediate need of 10,000 new treatment plants throughout the country; but the theme is handled on the basis of common sense rather than harangue. For this treatment a special commendation is due the General Electric Company, which produced the film in cooperation with the U.S. Public Health Service.

Distribution is to be through the electric utilities. Engineering groups might well wish to enjoy the film, not primarily because of its technical value, although that is considerable, but as an example of an admirable way to conduct an educational appeal with a minimum of the commercial element.

Traffic Conference Is Set for New York in September

OUTSTANDING traffic authorities will address the third annual traffic conference of the Eno Foundation when it meets September 6 in the Waldorf Astoria Hotel in New York. There will also be panel discussions on timely traffic problems. All those interested in traffic and safety are invited. Registration will begin at 9:00 a.m. and the morning session will convene at 10:00 a.m.

Code Officials Receive Tips on Modernization

WITH officials of many American cities engaged in the revision of building codes in order to speed the national housing program and prevent the erection of dangerous firetrap emergency buildings, the American Iron and Steel Institute has produced a series of eight reference bulletins covering technical phases of building regulation. Under the general title, "Building Code Modernization," the bulletins are being sent to code authorities. They are based on a long-term study of building practices throughout the United States, started in 1938 and carried out by the Institute's Committee on Building Codes.

The bulletins may be obtained from the American Iron and Steel Institute, 350 Fifth Avenue, New York 1, N.Y. There is no charge.

450,000-Mile Tests Bring Tire Wear, Cost Analysis

THE factors that directly affect tire wear and cost have been determined from the results of 450,000 miles of carefully controlled driving on gravel and bituminous surfaces and concrete pavements in Iowa, Kansas, Missouri, and Wyoming. The findings are reported by R. A. Moyer, Assoc. M. ASCE, and Glen L. Tesdall in Bulletin 161 of the Iowa Engineering Experiment Station, "Tire Wear and Cost on Selected Roadway Surfaces." This study is part of a general investigation of the effects of roadway surfaces on the costs of automobile operation, carried on in cooperation with the Public Roads Administration and requiring detailed observations with eight cars driven at speeds ranging from 25 to 65 mph.

Single copies of this 128-page bulletin may be obtained without charge from the Engineering Experiment Station, Iowa State College, Ames, Iowa.

A.A.S.H.O. Schedules Annual Meeting for December

DATES have been fixed for the annual meeting of the American Association of State Highway Officials. Los Angeles, Calif., is the place, the Biltmore Hotel the headquarters, and December 17–20, 1946, the time. Program details will be decided as soon as conditions permit. Inquiries should be addressed to the A.A.S.H.O. at 1220 National Press Building, Washington 4, D.C.

NEWS OF ENGINEERS

Personal Items About Society Members

ANDREW G. BISSET, captain, CEC, has been released from duty as senior member of the contract board of the Navy Bureau of Yards and Docks and has accepted a new assignment as public works officer at the Portsmouth (N.H.) Naval base. During the war Captain Bisset commanded construction battalions at advanced Pacific bases.

CHARLES R. VELZY is now with the New York consulting firm of Buck, Seifert and Jost as engineer in charge of the design and construction of sewage works. Until lately he was in charge of the New York office of Greeley and Hansen, Chicago consultants.

GERALD E. SHAW has been appointed engineer of bridges for the Canadian Pacific Railway at Montreal, Canada. He was formerly assistant engineer.

RAYMOND W. SAUER, lieutenant colonel, Army Corps of Engineers, has been promoted from the position of district engineer for the U.S. Engineer Office at Vicksburg, Miss., to that of executive assistant.

RUSSELL B. MOORE and MARK B. OWEN have formed the Indianapolis (Ind.) consulting firm of Moore and Owen. The firm was previously called the Russell B. Moore Company, and Mr. Owen was a member of its engineering staff.

WILLIAM H. M. LAUGHLIN, until lately chief engineer for the Dominion Bridge Company at Toronto, Canada, has become a member of the Toronto consulting firm of Proctor, Redfern, and Laughlin (formerly James Proctor and Redfern). Another member of the Society, E. M. PROCTOR, is also a partner.

ARTHUR E. STANLEY, who was recently discharged from the Army with the rank of colonel, has returned to his position as a partner in the Stanley Engineering Company at Muscatine, Iowa, after five years in the Air Corps.

KENNETH B. REYNOLDS has taken a position in the engineering office of C. C. KENNEDY, San Francisco (Calif.) consultant. Mr. Reynolds recently returned from China, where he was a first lieutenant in the Marine Corps Reserve.

L. H. HEWITT, colonel, Army Corps of Engineers, has been transferred from Washington, D. C., where he was on the Beach Erosion Board, to Seattle, Wash., as district engineer for the Seattle District.

JOHN A. LONG has severed his connection as manager of the County Highway Officials and Municipal Highway Officials Divisions of the American Road Builders Association to become executive secretary of the Florida State Builders' Association at Tallahassee. Mr. Long was in the Army Ordnance Department for three years, having the rank of major at the time of his discharge.

ALLEN S. JANSSEN, following his release from Naval duty, has returned to the University of Idaho as professor of civil engineering and acting dean of engineering. At the time of his separation from the Civil Engineer Corps, Mr. Janssen had the rank of lieutenant commander.

RAYMOND P. MINDLIN, of the Columbia University staff, was recently awarded the Medal for Merit by President Truman for his work during the war in developing the radio proximity fuse, which is credited with having played a decisive part in major battles.

RICHARD H. TATLOW III has been elected president of Abbott, Merkt and Company, New York industrial engineers. Mr. Tatlow was formerly a partner in Harrington and Cortelyou, consulting engineers of Kansas City and Washington, D.C., and during the war was in charge of new industrial facilities for the Production Division of Army Service Forces, having the rank of colonel. In his new capacity, Mr. Tatlow succeeds HUNLEY ABBOTT, who has been made chairman of the Board.

L. CEDRIC MACABEE, consulting engineer of Palo Alto, Calif., has opened a branch office in Oakland, Calif., under the management of MORGAN M. LEWIS, of San Francisco.

HENRY K. EVANS is now director of the Traffic Engineering Division of the National Conservation Bureau, New York. For the past three years he has been a traffic engineer for the Bureau.

THOMAS S. BURNS and Waldo I. Kenerson have formed the consulting firm of Burns and Kenerson, Inc., with offices in Boston. The new firm will specialize in airfields,

dams, flood control, foundations, hydroelectric power developments, water supply, and military buildings and special installations. Until lately, Mr. Burns was in the U.S. Engineer Office at Providence, R.I.

WALTER H. NILES, recently released from the Army Air Corps with the rank of major, was awarded the Legion of Merit in presentation ceremonies at Mitchell Field "for his work in developing automatic controls for the eventual 'push-button' airplane." In his civilian status, Mr. Niles is a partner in the industrial design firm of Bruce Kamp Associates, with offices in New York and Philadelphia.

NICHOLAS CIRINO has established an engineering practice in San Francisco, where he will specialize in the design and construction of roads, utilities, water supply, sewage disposal, structures, and surveying. He was previously district engineer for the War Food Administration in San Francisco.

JOHN J. LEDBETTER, JR., who was recently discharged from the Army Corps of Engineers, with the rank of colonel, has accepted a position as full-time executive secretary of the Texas Society of Civil Engineers, with headquarters in Austin. Prior to entering the Army in 1941, Mr. Ledbetter was acting counsel in charge of the legal section of the International Boundary Commission at El Paso, Tex.

CARLTON B. JANSEN has been elected president of the Dravo Corporation, Pittsburgh, succeeding the late V. B. Edwards. Mr. Jansen has spent his entire career with Dravo—most recently in the capacity of general manager of the contracting division.

PORTLAND P. FOX is now geologist in charge for the U.S. Bureau of Reclamation at Billings, Mont.

JULIAN P. HINTON has returned to his position in the Power Section of the Tennessee Valley Authority at Knoxville, Tenn., after serving as a lieutenant in the Army Air Corps.

S. S. STEINBERG, dean of the college of engineering at the University of Maryland, has been elected an honorary member of the Institute of Engineers of Chile. Dr. Steinberg was similarly honored by the Argentine Society of Engineers in recent months.

ARTHUR J. BENLINE has been appointed Borough Superintendent of Housing and Building for Manhattan as a result of competitive examinations. Society members appointed to similar office in the other boroughs are EDWARD CRINNION, Bronx; BENJAMIN SALTZMAN, Brooklyn; and JOSEPH HERMAN, Richmond. All except Mr. Herman are veterans.

CARL HINSHAW has been appointed one of nine House of Representatives members of the permanent Joint Congressional Committee on Atomic Energy. Congressman Hinshaw, only Society member in Congress, took an active part in the debate on the House floor in connection with the passage of the bill, S. 1717, which resulted in the enactment of Public Law 585, creating the committee. A resident of Pasadena, Calif., Congressman Hinshaw will be remembered by ASCE members for the address he delivered at the 1946 Spring Meeting in Philadelphia on "The Engineer in Public Life" (CIVIL ENGINEERING, May 1946).

ROBERT L. SUMWALT, dean of the school of engineering at the University of South Carolina, received the honorary degree of doctor of science from the University of Delaware on June 17.

HARALD M. WESTERGAARD, who retired on June 30 as dean of the Graduate School of Engineering at Harvard University, will continue to fill the post of Gordon McKay Professor of Civil Engineering, in which capacity he has served the university since 1936. As noted in the July issue, GORDON M. FAIR has succeeded Dr. Westergaard as dean.

WILSON V. BINGER has resigned as soils engineer for Parsons, Brinckerhoff, Hogan and Macdonald at Caracas, Venezuela, to become chief of the soils and foundations section of the Special Engineering Division of the Panama Canal. He will be engaged in the current Isthmian Canal Studies, with headquarters at Diablo Heights, C.Z.

GERALD F. BRIGGS recently returned from Germany, where he was serving as a colonel with the 332d Engineer Regiment, and is field engineer for Edward E. Johnson, Inc., of St. Paul, Minn.

SAMUEL R. WRIGHT has been appointed head of the department of civil engineering at the Agricultural and Mechanical College of Texas. Formerly he was professor of municipal and sanitary engineering and acting head of that department. He has just earned the college's first Ph.D. degree in engineering, his fourth from A. and M. College.

WILLIAM E. ELAM has been promoted to the position of chief engineer of the Board of Mississippi Levee Commissioners after forty years with the Board in the capacity of assistant engineer. Mr. Elam was a pioneer in the theory of cutoffs for the control of floods on the Mississippi.

SEBASTIAN OSPINA and CARLOS OSPINA were recently awarded the National Prize of Engineering of Colombia for their study on the subject of increasing the water supply of the city of Cali. Presentation was made by the president of Colombia at the celebration of the 59th anniversary of the Colombian Society of Engineers. Dr. Sebastian Ospina is well known as a student of the economy of his country, and Carlos Ospina is in charge of the Cali office of the New York firm of Parsons, Brinckerhoff, Hogan and Macdonald.

R. McC. BEANFIELD, until lately a lieutenant colonel in the Army Corps of Engineers, has opened a new office in Los Angeles, Calif. Before the war, Mr. Beanfield was consultant and adviser in matters pertaining to structural design, seismic analysis, harbor and waterfront engineering, construction methods, and plant layouts.

NORMAN B. CONWAY, for the past seven years assistant district highway engineer for the U.S. Indian Service at Spokane, Wash., has been transferred to the Phoenix, Ariz., office of the Service as district highway engineer. This office supervises the construction and maintenance of roads and bridges on Indian Reservations in the states of Arizona, New Mexico, Utah, and Colorado.

W F. TUETING, JR., following his release from the Navy Civil Engineer Corps, has become connected with Warren and Van Praag, Inc., consulting engineers of Decatur, Ill.

GEORGE L. FREEMAN, New York City consultant, received the honorary degree of doctor of engineering from the University of Maine at this year's commencement exercises. Mr. Freeman is a member of the firm of Moran, Proctor, Freeman, and Mueser.

SIMON PERLITER and ARTHUR R. SORING have established a consulting engineering practice in Los Angeles, Calif. Previously both were in the U.S. Engineer Office at Honolulu, Hawaii.

HENRY A. ROSS has resigned as city engineer of Redding, Calif., to accept the position of assistant city engineer of El Centro, Calif. He will be succeeded by WILLIAM W. GREEN.

HANS KRAMER has become connected with the St. Louis, Mo., consulting firm of Sverdrup and Parcel, specializing in hydraulic structures and navigation and flood-control projects. He will be in the San Francisco office of the organization. General Kramer was recently discharged from the Army Corps of Engineers, with the rank of brigadier general.

JOHN T. TUCKER has severed his connection as secretary and chief engineer of the North Dakota State Water Commission at Bismarck and is now civilian superintendent of the Naval proving grounds at Fort Hueneme, Calif. During the war, Mr. tucker served as a lieutenant in the Navy Civil Engineer Corps. He will be succeeded at Bismarck by JOHN J. WALSH, who was acting secretary and chief engineer while Mr. Tucker was in the Navy.

WILLIAM W. WANAMAKER, colonel, Army Corps of Engineers, was recently appointed district engineer at the newly established U.S. Engineer Office at Garrison, N.Dak.

E. LELAND DURKEE was a recent recipient of the honorary degree of doctor of engineering from Worcester Polytechnic Institute. Mr. Durkee is engineer-in-charge of bridge erection for the McClintic-Marshall Company.

WILLIAM MARTIN JOHNSON, following his release from the Army Sanitary Corps, in which he served as a lieutenant colonel, has returned to the consulting firm of Wiley and Wilson, with offices at Lynchburg and Richmond, Va.

TRUMAN B. SCHLUP has resigned as city engineer of Kansas City, Kans., and established a civil engineering practice in Kansas City.

W. D. FAUCETTE, executive representative of the Seaboard Air Line Railway, has been appointed chairman of the Committee of Research and Planning. Mr. Faucette will continue to handle the matters now under his jurisdiction, and Norfolk will continue to be his headquarters.

CHARLES B. BREED is retiring as head of the department of civil and sanitary engineering at Massachusetts Institute of Technology after almost fifty years of service.

Professor Breed, who joined the M.I.T. faculty in 1897, following his graduation there, has just completed a term as Director of the Society.

ARNOLD H. VANDERHOOF has reopened his consulting engineering office in Asheville, N.C., following his release as a lieutenant commander in the Naval Reserve.

M. T. WHITMORE, until lately a lieutenant colonel in the Army Corps of Engineers, has established an engineering practice in Atlanta, Ga.

DECEASED

WILLIAM J. CARTER (M. '04) of Cleveland, Ohio, died there on Aug 5, 1946. Mr. Carter, who was 76, was city engineer of Cleveland in the early part of the century. During his tenure of office he helped plan the business and industrial sections of Cleveland, and supervised construction of many of the city's bridges and public buildings. After leaving his post with the city, Mr. Carter organized the Carter-Richards Company, of which he was president for many years. He retired about two years ago.

WILLIAM GEORGE CLARK (Jun. '88) consulting engineer of Toledo, Ohio, died on July 11, 1946, at the age of 88. Mr. Clark had the distinction of being the Society's oldest Junior, having joined the Society in that grade in 1888—before ultimate transfer to a higher grade became compulsory. He first went to Toledo as assistant engineer in the office of the city engineer, and in 1895 became city engineer. During his incumbency he supervised construction of several city bridges and of the new Lake Erie Water Works Project. From 1900 until his retirement in March 1945 Mr. Clark maintained a private consulting practice in Toledo, serving as consultant to the city for much of this period.

GEORGE CLAPP DANFORTH (M. '20) consulting hydraulic engineer of Augusta, Me., died in a hospital there on June 30, 1946. Mr. Danforth, who was 64, had maintained a consulting practice in Augusta since 1925, specializing in hydroelectric developments and water supply. His commissions as consultant included power studies for the Tennessee River development and hydroelectric investigations in Brazil for the Electric Bond and Share Company. Earlier in his career he had been chief engineer of the Maine Water Power Commission, and during the first World War served overseas with the 602d Engineers. He had been a major in the Corps of Engineers Reserve since 1919.

STEPHEN HARRIS (M. '02) retired engineer of Philadelphia, Pa., died at his home there on June 24, 1946, at the age of 81. Mr. Harris had been with the Nicaragua Canal Commission, the Philadelphia and Reading Railroad, and the Philadelphia Rapid Transit Company. From 1913 to 1932 he was design engineer for the Philadelphia Department of City Transit, and from 1933 to 1936 engineer of design for the Delaware River Joint Commission at Camden, N.J. He then had a consulting practice in Philadelphia until he retired.

GEORGE BECKLEY HULL (M. '11) of Altadena, Calif., died in Mobile, Ala., on March 24, 1946. Mr. Hull, who was 70, spent much of his engineering career in Canada. He was with the Alberta Railway and Coal Company for five years and the Canadian Pacific Railway for a similar period and, beginning in 1910, was for many years in the Department of Public Works of Canada—chiefly as district engineer at Prince Rupert, B.C. In 1929 he became vice-president and general manager of the Sinaloa Land Company in Sinaloa, Mex., and later was in the Los Angeles office of the organization.

CHARLES SCOTT LANDERS (M. '27) consulting engineer of New York City, died at his home there on July 27, 1946, at the age of 66. An expert on the construction of foundations, Mr. Landers had been a consultant to the Pennsylvania Railroad on its tunnels under the Hudson River, and had worked with the Foundation Company, of New York, on foundation problems of the Trinity and Municipal Buildings. From 1912 on he had his own consulting practice, and in that capacity was engaged on the construction of the Equitable Building, the American Telephone and Telegraph Building, the Woolworth Building, and other important New York structures. Mr. Landers was also designer and builder of the tennis stadium at Forest Hills.

GEORGE ALLEN LEE (M. '13) consulting engineer of Auckland, New Zealand, died in July 1945, at the age of 64, according to word just received at Society Headquarters. Born and educated in New Zealand, Mr. Lee spent his engineering career there. He was principal assistant engineer for the Otago Harbor Board and Dock Trust from 1906 to 1911, and chief engineer for the Bluff Harbor Board from the latter year to 1919. He then established a consulting practice in New Plymouth, moving later to Auckland.

WILLIAM IRA LEE (M. '23) retired engineer of Emporia, Va., died in a veterans' hospital in Richmond, Va., on July 5, 1946. He was 73. Early in his career Mr. Lee was engaged in railroad construction, and was with the Virginia State Highway Commission, successively as resident engineer and division engineer. During the first World War he was a major in the A.E.F. and, following his return from overseas in 1919, resumed his connection with the Virginia State Highway Commission. Later Mr. Lee was county engineer for Charles City County, Virginia, and for several years was in private practice. From 1928 until his recent retirement he was with the Public Roads Administration—first on the construction of the Mt. Vernon Memorial Highway between Washington and Mt. Vernon and, from 1932 on, at Gatlinburg, Tenn. He was a colonel in the Engineers Reserve.

THOMAS JOHN MORRISON (M. '09) former public works commissioner of Rochester, N.Y., died in a hospital in that city on July 30, 1946, at the age of 66. From 1896 to 1910 Mr. Morrison was resident engineer for the state in charge of the Monroe County section of the Barge Canal. He resigned in the latter year to open his own consulting offices. He was public works commissioner from 1935 to 1938, and in 1939 served as state engineer for the WPA. During his tenure as commissioner the city engaged in a multi-million-dollar building program.

CHARLES EDWARD PARRY (M. '24) chief engineer for the Pennsylvania Public Utility Commission, Harrisburg, Pa., died there on July 7, 1946. He was 69. Mr. Parry was born and educated in England, coming to this country in 1906 as assistant chief draftsman for the Minneapolis, St. Paul and Sault Ste. Marie Railway. During the first World War he was a captain in the Royal Engineers in service in France, and later was assistant city engineer of Allentown, Pa., and chief construction engineer for the Municipal Disposal Company of Philadelphia. He had been with the Public Utility Commission since 1939 except for a period of service in the technical division of the Philadelphia Navy Yard during the recent war.

JAMES EDWARD PIRIE (M. '22) district engineer for the Texas State Highway Department at Paris, Tex., died in July 1946. Mr. Pirie, who was 65, had been with the Texas State Highway Department since 1919, and was one of a group of veteran employees who recently received certificates of honor from the department for twenty-five years of meritorious service. Earlier in his career he had been with the Southern Pacific Railroad and assistant city engineer of Houston, Tex. Long active in the Texas Section, Mr. Pirie served as president in 1930.

JAMES OSCAR POTTER (Assoc. M. '44) city engineer of Quincy, Ill., died in the La Salle Hotel fire in Chicago on June 5, 1946, a few days before his 31st birthday. Following his graduation from the University of Illinois in 1938, Mr. Potter became field and office engineer for the Adams County, Illinois Highway Department. He held that position until 1941, when he became connected with the city of Quincy—first as assistant city engineer and, since December 1942, as city engineer.

PHILIP WALLIS PRICE (M. '27) of Pittsburgh, Pa., died in a hospital there recently, at the age of 65. Mr. Price was employed by the Pennsylvania Railroad and the Gulf Oil Corporation prior to becoming assistant engineer in the Allegheny County Department of Works in 1914. He held the latter position until 1941 when he retired. Mr. Price served with the 107th Field Artillery in the first World War, and had a captain's commission in the Reserve Corps. He was active in the Pittsburgh Section and had served it as vice-president.

CHARLES MORRISON SCUDDER (Assoc. M. '22) assistant engineer for the A. O. Smith Corporation, of Milwaukee, Wis., died on July 12, 1946. Mr. Scudder, who was 56, was for some years in the hydraulic turbine department of the Allis-Chalmers Manufacturing Company, Milwaukee. More recently he was vice-president and treasurer of the Gilson Bolens Manufacturing Company, Port Washington, Wis., and in 1940 he became connected with the A. O. Smith Corporation. During the first World War he served in the 107th Engineers, having the rank of captain.

VALERIANO SEGURA (M. '27) of Manila, P.I., was killed in the battle for the defense of Bataan on February 20, 1942, it is reported to the Society. Mr. Segura, who was 51, was with the Philippine Bureau of Public Works from 1912 to 1928, finally in the position of division engineer in charge of construction work. He then established an engineering and contracting practice in Cebu and, at the time of his death, was serving as a captain in the U.S. Armed Forces in the Far East.

CHARLES STEPHEN SHAUGHNESSY (M. '23) chief examiner of the Philadelphia (Pa.) Civil Service Commission, died in a hospital in Asheville, N.C., on July 14, 1946. His age was 69. Mr. Shaughnessy had been with the Pennsylvania Railroad; engineer on improvement for the city of Boston; and engineering examiner for the Municipal Civil Service Commission in New York. From 1920 on he was chief examiner for the Philadelphia Civil Service Commission, from which he had recently been on leave of absence for his health. In 1936 Mr. Shaughnessy was honored by the American Society of Municipal Engineers with a gold medal "for long and meritorious service in city government." He had been active in the Philadelphia Section, of which he was a former president. At the time of his death Mr. Shaughnessy was a member of the Society's Committee on Salaries.

NORTON QUINCY SLOAN (M. '26) vice-president and secretary of Hillsmith and Company, of Dayton, Ohio, died in that city on July 24, 1946. Mr. Sloan, who was 61, had been with Hillside and Company since 1911—at first in the New York office of the company. During his long connection with the organization, he supervised the design and construction of many buildings and industrial plants throughout Ohio. He was also associated with Frank Hillsmith, Inc., a New York corporation; the 43d Street Warehouse Company, of Pittsburgh; and the Dayton Hydraulic Co.

FRED WALTER STIEFEL (Assoc. M. '24) president of the Stiefel Construction Corporation, New York, died in a hospital in Liberty, N.Y., on July 25, 1946, as a result of injuries suffered in an automobile accident a few hours earlier. He was 52. For the past twenty-five years Mr. Stiefel had been engaged in managing large heavy-construction projects—for most of this period as chief engineer for Samuel R. Rosoff, New York contractor. He formed his own construction company in 1943. The work on which he had been engaged included nine subway contracts, the Manhattan Intercepting Sewers, fifteen miles of the New York City Delaware Aqueduct, the Manhattan Plaza of the Midtown Tunnel, and the Third Gatun Locks of the Panama Canal. Mr. Stiefel had contributed articles to CIVIL ENGINEERING, and in 1944 won the Construction Engineering Prize for his article, "Inclined Mine Shaft Sunk in the Adirondacks," which described the work of his company in opening the Fisher Hill Mine.

STARR TRUSCOTT (M. '19) chief of the hydrodynamics division at the Langley Memorial Aeronautical Laboratory, National Advisory Committee for Aeronautics, Langley Field, Va., died suddenly in his home at Fox Hill, Va., on July 16, 1946. Mr. Truscott, who was 60, had served as designer on the Panama Canal lock caissons, as assistant engineer for the Panama Railroad, and with the Navy Bureau of Aeronautics on the design of lighter-than-air craft. He had been with the National Advisory Committee for Aeronautics since 1926 and chief of the hydrodynamics division since 1929. In the latter position, he pioneered in innovations in towing tank design, and was responsible for development of modern facilities for study of the hydrodynamics of flying boats.

GEORGE ELLIOT VERRILL (M. '04) of Santa Barbara, Calif., died on June 28, 1946, at the age of 80. From 1891 to 1917 Mr. Verrill was with the U.S. Engineer Department on river and harbor work. After wartime service as a major in the Army Corps of Engineers, he returned to the U.S. Engineer Department, which he later served as resident engineer in charge of the construction of breakwaters in Hawaii. He also supervised the construction of hydroelectric developments in Peru for the Foundation Company of New York, and from 1926 to 1930 was resident engineer for Francis B. Smith in charge of the construction of dock and harbor installations at Monterey and Santa Barbara. From the latter year until his retirement in 1943 Mr. Verrill maintained a consulting practice in Santa Barbara.

WILLIAM HOOK WOODBURY (M. '13) of Kansas City, Mo., died in his home there on July 5, 1946. Mr. Woodbury, who was 69, had spent his career in railroad work. He had been with the Kansas City Southern Railway; the Gulf, Colorado and Santa Fe Railroad; and the Northern Pacific and the Canadian Pacific. From 1916 until 1942 he was with the Duluth and Iron Range Railroad Company and the Duluth Missabe and Northern Railway Company—first as valuation engineer, and later as engineer of maintenance at Duluth.

Changes in Membership Grades

Additions, Transfers, Reinstatements, and Resignations

From July 10 to August 9, 1946, Inclusive

ADDITIONS TO MEMBERSHIP

ANDERSON, JOHN ARTHUR (Jun. '46), 3745 California Ave., Long Beach, Calif.

BALLAM, HORACE VICTOR (M. '46), Sec'y, Kramp Constr. Co., Gen. Cont., 2775 South 27th St. (Res., 1616 East Menlo Blvd.), Milwaukee 11, Wis.

BERRY, WILLIAM LITTEL (Assoc. M. '46), Asst. Hydr. Engr., State Div. of Water Resources, 803 State Bldg., Los Angeles (Res., 211 Twelfth St., Huntington Beach), Calif.

CHAMPION, CLARENCE JOHN, JR. (Jun. '46), Junior Engr., Bridge Section, State Highway Dept., La Pine, Ala.

COE, JACK JACOBI (Jun. '46), P.O. Box 632, Yuba City, Calif.

COLE, MARVIN LYNN (Jun. '46), Ensign, U.S.N., *U.S.S. Midway* CVB-41, Care, Fleet Post Office, New York, N.Y.

COLLIER, WRIGHT (Assoc. M. '46), Gen. Cons., Box 209, Bloomfield Hills, Mich.

COSTELLO, JOSEPH VINCENT (Jun. '46), 150 Webster Ave., Brooklyn 30, N.Y.

CUTHILL, JOHN ROBERT (Jun. '46), Draftsman, Office, Chf. of Engrs., War Dept., Washington, D.C. (Res., 100 Dewey Ave., Buffalo 14, N.Y.)

DERN, HERBERT (Jun. '46), Electronic Technician's Mate, 29 West 25th St., Bayonne, N.J.

DICKEY, JOE BEN, JR. (Jun. '46), 5828 Oak St., Kansas City, Mo.

DOLL, WARWICK LEWIS (Assoc. M. '46), Hydr. Engr., P-2, U.S. Dept. of Interior, U.S. Geological Survey Water Resources, Box 138, Rolla, Mo.

FLETCHER, NORMAN CHARLES (Assoc. M. '46), Chf. Engr., Structural Dept., Wire Industries Steel Products Co., Herschell Rd. (Res., 44 Northway), Durban, Natal, South Africa.

GENSERT, RICHARD MICHAEL (Jun. '45), 1243 Warren Road, Lakewood, Ohio.

GERKE, RICHARD CARL (Jun. '46), 602 Mariposa Ave., Sierra Madre, Calif.

GRAVES, LEROY DONALD (Assoc. M. '46), Engr. (Soil Mechanics) P-4, U.S. Army Engrs., Ohio River Div. Laboratories, Mariemont, Ohio.

HART, MELVIN LEE (Assoc. M. '46), Chf. Engr., Pate Eng. Co., Cons. Engrs., 301–306 Richard Bldg. (Res., 1220 South Quebec Ave.), Tulsa, Okla.

HERTZLER, RUSSELL CLARENCE, JR. (Assoc. M. '46), Engr., C. W. Good, Inc., 726 Columbia Ave., Lancaster (Res., Care Rhodes Coffee Shop, Scot Run), Pa.

HEWES, JOHN ALDEN (Assoc. M. '46), Civ. Engr., U.S. Bureau of Reclamation, Antioch, Calif.

HOAK, FRANK WILLIAM (Jun. '46), Ensign, U.S.N. R.; 146 Sixty-first St., Niagara Falls, N.Y.

HU, FU LIANG (Assoc. M. '46), Senior Engr., National Resources Comm. of China, Room 515, 111 Broadway, New York, N.Y. (Res., 1605 Highland Ave., Knoxville, Tenn.)

INMAN, JOSEPH COOPER (Jun. '46), Asst. Supt. (Field), Nimmons, Carr & Wright, 333 North Michigan, Chicago, Ill. (Res., 2326 North Talbot Ave., Indianapolis, Ind.)

JOHNSON, JOSEPH THOMAS (Jun. '46), 1552 South 78th St., West Allis, Wis.

JUSTUS, JAMES STANLEY (Jun. '46), 1010 South 8th, Apt. K, Tacoma, Wash.

KRASNICK, MAX AARON (Assoc. M. '46), Cost Engr., Socony Vacuum Oil Co. of Venezuela, Apartado 246, Caracas, Venezuela.

KUDROFF, MARVIN JAMES (Jun. '46), Structural Designer, The Ballinger Co., 105 South 12th St., Philadelphia 7, Pa.

KYLE, FRANK KENNETH (Jun. '46), Civ. Engr. (Junior), Burns & McDonnell Eng. Co., 107 West Linwood (Res., 4201 Locust), Kansas City 4, Mo.

LINDSAY, NORMAN LATSON (Jun. '46), 605 West 141st St., New York 31, N.Y.

LOOK, ROBERT GLENN (Jun. '46), 615 Clarkson St., Denver 3, Colo.

LOVERING, WENTWORTH REYNOLD (Assoc. M. '46), Associate Physical Testing Engr., State Div. of Highways, 3435 Serra Way, Sacramento 16, Calif.

LUCAS, GEORGE MICHAEL COHAN (Assoc. M. '46), Project Supt., J. A. Jones Const. Co., William and Third St., Atlanta, Ga.

MACOMBER, RONALD GIBBS (Jun. '46), 52 Irving St., Cambridge 38, Mass.

MARTIN, CLARENCE KEITH (Jun. '46), Senior Engr., Burns and McDonnell Eng. Co., 107 West Linwood Blvd., Kansas City, Mo.

MASHAW, LANE HICKS (Jun. '46), Ensign, U.S. Navy, 217 East Lincoln, Monticello, Ill.

MAUSER, DONALD BREWSTER (Jun. '45), Ensign, CEC, USNR, Care, Teresa Bocan, Box 522, Del Mar, Calif.

MAYER, ALBERT (M. '46), Archt. and Engr. (Mayer and Whittlesey), 31 Union Square West, New York 3, N.Y.

MCCANN, HAL DANE (Jun. '46), 1357 Elm Ave., No. S, Long Beach 6, Calif.

MERRILL, EDWARD ATKINSON (M. '46), Project Mgr., Skidmore, Owings & Merrill, Archts.—Engrs., 100 West Monroe St., Chicago 3, Ill.

MOORMAN, JAMES BOLLING, JR. (Jun. '46), 1007 North Grand Ave., Sherman, Tex.

MORGAN, JOSEPH EDWARD (Jun. '46), Ensign, CEC, USNR, Asst. Public Works Officer, Camp Peary, Va.

NEIL, FORREST CHRISTIAN (Jun. '46), Draftsman, Bldg. Dept., Illinois Central R.R., Central Sta. (Res., 225 North Austin Blvd.), Chicago 44, Ill.

NIELSEN, EDWIN GEORGE (M. '46), Regional Planning Engr., U.S. Bureau of Reclamation, Boulder City, Nev.

NORTON, HAROLD RUSSELL (Assoc. M. '46), Civ. Engr., Civilian Post Engr., 803d Army Air Forces Specialized Depot, Manheimn and Higgins, Park Ridge (Res., 7203 West Balmoral, Chicago), Ill.

NORWOOD, KENNETH THOMAS (Assoc. M. '46), Engr., Tucker-McClure, 649 South Olive, No. 1228, Los Angeles, Calif.

PANG, DAT QUON (Jun. '46), Corporal, U.S. Army; 938 North Vineyard St., Honolulu 7, T.H.

PATERSON, GEORGE (Assoc. M. '46), Asst. Engr., State Electricity Comm. of Victoria, 22 William St. (Res., 4 Thornton Ave., Surrey Hills E 10), Melbourne, Australia.

PAYAN, CESAR ALBERTO (Jun. '46), Soils Engr., Parsons, Brinckerhoff, Hogan & Macdonald, Edificio Suarez Costa-6° Piso, Calle 13, No. 7-60, Bogota, Colombia, S.A.

PICKETT, JESSE MALCOLM, JR. (Jun. '46), Ensign, U.S. Navy, Rochester, Ill.

PUGH, NORMAN JOHN (M. '46), Water Engr. and Mgr., Coventry Corp. Water Dept., Council House (Res., Brendon, Beechwood Ave.), Coventry, England.

RHINKA, EINO ARTHUR (Jun. '46), Chf. Engr., Post Engineers, Fort Richardson (Res., Box 1164, Anchorage), Alaska.

ROBISON, RALPH EUGENE (Jun. '45), Ensign, CEC, USNR, R.R. 2, Arthur, Ill.

ROSS, JAMES KNOX, JR. (Jun. '46), 20 Wynden Drive, Route 12, Box 194, Houston, Tex.

ROSS, JOHN GERALD (M. '46), Design Consultant, C. F. Braun & Co., 1000 South Fremont, Alhambra, Calif.

TOTAL MEMBERSHIP AS OF AUGUST 9, 1946

Members	6,405
Associate Members	8,328
Corporate Members	14,733
Honorary Members	36
Juniors	6,660
Affiliates	76
Fellows	1
Total	21,506
(August 9, 1945	20,971)

SCHNEIDER, WARREN ARTHUR (Assoc. M. '46), Waste Disposal Engr., City of Los Angeles, Room 748, City Hall, Los Angeles (Res., 707 Park Ave., South Pasadena), Calif.

SCHWARTZ, JOSEPH GEORGE (Jun. '46), 1593 Sterling Place, Brooklyn 13, N.Y.

SUTHERLAND, EARL CHALMERS (M. '46), Senior Highway Engr., Public Roads Administration, Federal Works Bldg. (Res., 335 Missouri Ave., N.W.), Washington 11, D.C.

TACKE, WALTER HENRY (Assoc. M. '46), Superv. Engr., Bureau of Street Constr., City of Milwaukee, City Hall, Room 301 (Res., 4239 North 19th Place), Milwaukee 9, Wis.

TORO, O. HORACIO (Assoc. M. '45), Civ. and Mining Engr., Empresa de Energia Electric of Medellin (Res., Apartado 3.3.6), Medellin, Colombia, S.A.

VOWINKEL, EDWARD AUGUST (Jun. '46), Design-Draftsman, M. W. Kellogg Co., 225 Broadway, New York (Res., 113 Ninth St., New Dorp, Staten Island), N.Y.

WARNER, RICHARD CALVIN (Jun. '46), 130 Westmont Drive, Alhambra, Calif.

WEAVER, RANDALL BREON (Assoc. M. '46), Chf., Design Branch, Engr. Div., U.S. Engr. Office, P.O. Box 2240, Honolulu, T.H.

WELCH, MARION CARLYLE (Jun. '46), Junior Engr. (Structural), Louisville Builders Supply Co., 1032 South 8th St., Louisville, Ky.

WOMACK, JOHN EDWIN (Assoc. M. '46), Estimating and Designing Engr., Nashville Bridge Co., P.O. Box 70, Bessemer (Res., 1716 Fourth Court West, Birmingham 8), Ala.

WONG, HSU-SUN (Assoc. M. '46), Associate Engr., Cluna Bridge Co., 2 Chung San Rd., Chungking (Res., Care, Mr. H. Wellington Wong, The Continental Bank, 1020 Chung Shan Rd., Hankow), China.

Changes of Address

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SECRETARY, ASCE, 33 W 39th St., New York 18, N. Y.

Please change my address to the following:

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Firm Name.....

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City..... P.O. Zone No..... State.....

Home Address.....

City..... State.....

Nature of Business.....

Mailing and Publications to ☐ Home ☐ Business

Listing in Yearbook to include:

☐ Home only ☐ Business only ☐ Home and Business

MEMBERSHIP TRANSFERS

ASHBRIDGE, WHITNEY (Jun. '26; Assoc. M. '38; M. '46), Engr., Bldg. Eng. Div., United Engrs. & Constructors, Inc., 1401 Arch St. (Res., 10 East Abington Ave.), Philadelphia 18, Pa.

AYRE, ROBERT STEVENSON (Jun. '36; Assoc. M. '46), Research Engr., Standard Oil Co. (Indiana), Chicago, Ill. (Res., 251 Webb St., Hammond, Ind.)

BAGLEY, HARRY HOWE (Jun. '27; Assoc. M. '38; M. '46), Comdr., CEC, USNR; 3205 Columbia Pike, Arlington, Va.

BRITTON, WILLIAM ROTHROCK (Assoc. M. '26; M. '46), Asst. Engr. of Bridge Constr., State Highway Comm., State House Annex, Indianapolis (Res., 29 West Main St., Knightstown), Ind.

CULLMER, ROBERT EDWARD (Jun. '42; Assoc. M. '46), (La Mesa Eng. Service), 4730 Palm Ave., La Mesa, Calif.

DAVIDSON, WILLIAM EDWARD (Jun. '36; Assoc. M. '46), Comdr., CEC, U.S. Navy, Bureau of Ordnance, Room 224, Navy Dept. (Res., 3800 Porter St., N.W.), Washington 16, D.C.

EVANS, WILLIAM SPEARING (Jun. '42; Assoc. M. '46), Archt. and Engr., 617 Ardis Bldg., Shreveport, La.

FREAS, ALAN D'VARMETT (Jun. '39; Assoc. M. '46), Engr., U.S. Forest Products Laboratory (Res., 2618 Park Pl.), Madison 5, Wis.

GEBHARD, JOHN CHARLES (Jun. '22; Assoc. M. '30; M. '46), Capt., CEC, U.S. Navy, Asst. Director, Planning and Design Dept. and Design Mgr., Bureau of Yards and Docks, Navy Dept., Washington 25, D.C.

GILCHRIST, FRANK (Jun. '44; Assoc. M. '46), Supervisor, Buildings and Grounds Unit, Constr. Div., Veterans Administration, Santa Fe Bldg. (Res., 1406 Young St.), Dallas 1, Tex.

GRAVES, CHARLES LEONIDAS (Jun. '38; Assoc. M. '46), Asst. Supt., J. Ray McDermott & Co., Inc., Box 383, Harvey, La.

JOHNSON, CECIL WILLIAM (Jun. '33; Assoc. M. '40; M. '46), Senior Civ. Engr., Public Works Dept., Puget Sound Naval Shipyard (Res., 163-M Russell Road), Bremerton, Wash.

MCGLAUFLIN, STANLEY ALLAN (Jun. '40; Assoc. M. '46), Structural Engr., The Austin Co., 877 Dexter Horton Bldg., Seattle (Res., Route 1, Box 168, Mercer Island), Wash.

ORRIN, ROBERT CARLTON (Jun. '41; Assoc. M. '46), Tech. Engr., Carbon & Carbide Chemical Corp. (Res., 1013 East Broadway), Oak Ridge, Tenn.

ORTON, DONALD WHITNEY (Jun. '40; Assoc. M. '46), Structural Engr., The Austin Co., 16112 Euclid Ave. (Res. 23241 Lake Shore Blvd.), Cleveland 17, Ohio.

PANUZIO, FRANK LOUIS (Jun. '31; Assoc. M. '40; M. '46), Prin. Civ. Engr., New York Dist. War Dept., U.S. Engr. Office, 120 Wall St., New York. (Res., 1385 Capitol Ave., Bridgeport 4, Conn.)

RIDDICK, THOMAS MOORE (Jun. '32; Assoc. M. '40; M. '46), Cons. Engr. and Chemist, 369 East 149th St., New York 55, N.Y.

STANLEY, ARTHUR EMMONS (Assoc. M. '41; M. '46)(Stanley Eng. Co.), Hershey Bldg., Muscatine, Iowa.

STIEMKE, ROBERT EDWARD (Jun. '42; Assoc. M. '46), Associate Prof. of San. Eng., North Carolina State College, Raleigh, N.C.

VREELAND, ROBERT PAUL, JR. (Jun. '32; Assoc. M. '46), Instr., Yale Univ. (Res., 387 Howard Ave.), New Haven, Conn.

WAGNER, FRANCIS VINCENT (Jun. '38; Assoc. M. '46), Structures Engr., North Am. Aviation, Inc., Municipal Airport, Los Angeles (Res., 937 South Larch St., Apt. G., Inglewood), Calif.

WELLS, JOSEPH VAN BRUNT (Jun. '30; Assoc. M. '38; M. '46), Dist. Engr., Water Resources Branch, U.S. Geological Survey, 531 Federal Bldg., Louisville, Ky.

WERNER, MAX ALFRED, JR. (Jun. '36; Assoc. M. '46), Div. Maintenance Supt., E. I. du Pont de Nemours & Co., Inc., Belle (Res., 1142 Hickory Rd., Charleston), W.Va.

REINSTATEMENTS

CLARE JIMENEZ, MANUEL EMILIO, Jun., reinstated July 26, 1946.

CLARK, CHARLES SAMUEL, M., reinstated July 24, 1946.

FOLEY, WILLIAM EDWARD, Assoc. M., reinstated July 15, 1946.

HOUTMAN, GUSTAVE DESIRE, Assoc. M., reinstated July 16, 1946.

HOWARD, HENRY GEORGE, Assoc. M., reinstated July 15, 1946.

HUNNICUTT, JAMES MADISON, Assoc. M., reinstated July 8, 1946.

LIKINS, ROY DOUGLAS, Assoc. M., reinstated July 25, 1946.

LOWDEN, SPENCER W., Assoc. M., reinstated July 10, 1946.

MESSNER, EDWARD GRANT, Assoc. M., reinstated July 13, 1946.

SAWYER, PERCY, M. reinstated July 15, 1946.

SUMMERS, WAYNE, Assoc. M., reinstated July 10, 1946.

TRIVELY, ILO ALLELY, Assoc. M., reinstated June 10, 1946.

VINTON SAMUEL SPENCER, JR., Assoc. M., reinstated July 16, 1946.

WALKER, ROBERT YULE, Assoc. M., reinstated July 10, 1946.

WEST, RANDOLPH COOPER, Assoc. M., reinstated July 10, 1946.

RESIGNATIONS

BRAHTZ, JOHN FREDERICK, Jun., resigned July 5, 1946.

BUXTON, EDMUND ROSS, JR., Jun., resigned July 12, 1946.

LEWIN, HAROLD ANDREW, Assoc. M., resigned July 19, 1946.

ROUVEROL, WILLIAM SPENCE, Jun., resigned July 3, 1946.

SHIMER, ROY, Jun., resigned July 3, 1946.

Applications for Admission or Transfer

Condensed Records to Facilitate Comment from Members to Board of Direction

SEPTEMBER 1, 1946 NUMBER 9

The Constitution provides that the Board of Direction shall elect or reject all applicants for admission or for transfer. In order to determine justly the eligibility of each candidate, the Board must depend largely upon the membership for information.

Every Member is urged, therefore, to scan carefully the list of candidates published each month in CIVIL ENGINEERING *and to furnish the Board with data which may aid in determining the eligibility of any applicant.*

It is especially urged that a definite recommendation as to the proper grading be given in each case, inasmuch as the grading must be based upon the opinions of those who know the applicant personally as well as upon the nature and extent of his professional experience. Any facts derogatory to the personal character or professional reputation of an applicant should be promptly communicated to the Board.

Communications relating to applicants are considered strictly confidential.

The Board of Direction will not consider the applications herein contained from residents of North America until the expiration of 30 days, and from non-residents of North America until the expiration of 90 days from the date of this list.

MINIMUM REQUIREMENTS FOR ADMISSION

GRADE	GENERAL REQUIREMENT	AGE	LENGTH OF ACTIVE PRACTICE	RESPONSIBLE CHARGE OF WORK
Member	Qualified to design as well as to direct important work	35 years	12 years	5 years RCM*
Associate Member	Qualified to direct work	27 years	8 years	1 year RCA*
Junior	Qualified for subprofessional work	20 years	4 years	
Affiliate	Qualified by scientific acquirements or practical experience to cooperate with engineers	35 years	12 years	5 years RCM*

* In the following list RCA (responsible charge—Associate Member standard) denotes years of responsible charge of work as principal or subordinate, and RCM (responsible charge—Member standard) denotes years of responsible charge of IMPORTANT work, i.e., work of considerable magnitude or considerable complexity. The time statements shown are as presented by the applicant.

APPLYING FOR MEMBER

BAILEY, WILLIAMS DUNLAVY, Wappingers Falls, N.Y. (Age 45) (RCA 8.6 RCM 6.4) Oct. 1945 to date Superv. Engr., Elwyn E. Seelye & Co., New York City; previously Lt. Comdr., U.S. Naval Constr. Bns.; Civ. Engr., Tuttle, Seelye, Place & Raymond.

BASTESEN, OLAF, Chicago, Ill. (Age 54) (RCA 5.3 RCM 10.1). March 1941 to date as Asst. Subway Designer, Dept. of Subways and Superhighways, Chicago, Ill.

BAUKNIGHT, WILFRED (Assoc. M.) Pittsburgh, Pa. (Age 35) (RCA 5.0 RCM 11.2) Oct. 1932 to date with U.S. Engr. Office, from Dec. 1942 to Jan. 1946, successively, Lieut., Capt., and Major; at present, Engr., being Deputy Chf. Constr. Div.

BRUNER, LEON CHARLES, Atlanta, Ga. (Age 52) (RCA 3.0 RCM 8.0) 1942 to date Engr. in charge, CAA 2d Region; Chf. of Party, Washington State Highway Dept.

BRUMER, MILTON (Assoc. M.) New York City. (Age 44) (RCA 3.2 RCM 17.4) Feb. 1940 to May 1942, June to July 1943 and Dec. 1944 to date Prin. Design Engr. with O. H. Ammann, Cons. Engr., New York City; in the interim, Structural Engr., Knappan Eng. Co., New York City; Prin. Design Engr. for Ralph Smillie Cons. Engr., New York City.

BUBB, GRANT EDWARD (Assoc. M.), Martinsville, Md. (Age 41) (RCA 8.8 RCM 10.1) Jan. 1932 to date with E. I. du Pont de Nemours & Co., Inc., since Nov. 1944 as Field Project Engr.

CARLSON, ELMER HUGO, Marblehead, Mass. (Age 54) (RCA 10.2 RCM 16.0) Oct. 1940 to date, Structural Engr., Jackson & Moreland, Boston, Mass.

CHILCOTE, WILLIAM LEONARD (Assoc. M.), Baltimore, Md. (Age 40) (RCA 2.6 RCM 14.6) Oct. 1942 to date with CEC, USNR as Lt. (j.g.), Lt., and Commdr. (CEC), Civil Works Engr., N.Y. Civil Works Dist.; previously with Baltimore Comm. on Civilian Defense.

CORRADI, PETER (Assoc. M.), Scarsdale, N.Y. (Age 35) (RCA 4.2 RCM 6.6) Jan. 1941 to date with CEC, USNR, at present as Public Works Officer and Officer-in-Charge of Construction, U.S. Naval Station, Lakehurst, N.J.

CRAWFORD, ROSCOE CAMPBELL, Washington, D.C. (Age 58) (RCA 3.6 RCM 24.7) Sept. 1912 to date with U.S. Army; since Jan. 1946 as Asst. Chf., Office of Chf. of Engrs., Washington D.C.

DABBAGH, MOHAMED FAHMY, Jaffa, Palestine. (Age 35) (RCA 4.8 RCM 7.2) Dec. 1934 to date with Jaffa Municipal Corporation, Palestine, since Sept. 1941 as City Engr.

DEARDORFF, HERBERT HADLEY (Assoc. M.), Albany, Calif. (Age 38) (RCA 6.0 RCM 5.6) Dec. 1936 to date Jun., Asst., and Associate Engr. with California Div. of Highways.

DE LA TORRE, MARIO (Assoc. M.), Bolivia, S.A. (Age 37) (RCA 6.5 RCM 6.6) July 1945 to date Chf. Engr., Cia McGraw-Warren, S.A.; previously with Ministry of Public Works, Ecuadorian Govt., Quito, Ecudor; various positions with Pan American Airways in Brazil and Miami, Fla.

DILLARD, JEHU JACKSON, Galveston, Tex. (Age 43) (RCA 2.7 RCM 8.0) Jan. 1931 to date with U.S. Engr. Office, since March 1944 as Senior Engr., being Asst. Chf. of Design Sec., Galveston, Tex.

FISCHMAN, LEON HENRY, Lewiston, Me. (Age 38) (RCA 4.8 RCM 8.3) Sept. 1943 to date Lt. Comdr., CEC, USNR, being Asst. Public Works Officer, Philadelphia Naval Shipyard; previously Associate Civ. Engr. Bureau of Yards and Docks, U.S. Navy.

FOSTER, GEORGE M., East Lansing, Mich. (Age 46) (RCA 12.9 RCM 9.5) June 1922 to July 1935 and Sept. 1945 to date with Michigan Highway Dept., at present as Bridge Engr.; in the interim Cons. Engr. (private practice).

FREUDENTHAL, ALFRED (Assoc. M.), Tel Aviv, Palestine. (Age 40) (RCA 5.6 RCM 8.6) April 1946 to date Cons. Engr. for Marine Trust Ltd., Tel Aviv Municipality, Contractors and Architects; previously Asst. Res. Engr. and Res. Engr., Tel Aviv Port, Marine Trust Ltd.

GANONG, CARL FIELD, Seattle, Wash. (Age 59) (RCA 10.7 RCM 9.2) July 1939 to date Senior Lighthouse Engr., U.S. Coast Guard, being Lt. Comdr., Comdr., and Capt.

GAUTIER, EUGENIO BENITEZ, Santurce, Puerto Rico. (Age 43) (RCA 6.5 RCM 10.5) 1945 to date Asst. Engr., Production and Distribution Dept., Aqueduct & Sewer Service of Puerto Rico; previously Gen. Supt. for construction of Cidra Dam; Gen. Supt., for H. I. Hettinger & Co.

GIFFIN, HAROLD WENDELL (Assoc. M.) Trenton, N.J. (Age 55) (RCA 8.3 RCM 21.0) 1925 to date with State Highway System as Field Engr. (7 years) and since 1933 Engr.

GREENAWALT, WILLIAM PORTER (Assoc. M.) Chicago, Ill. (Age 48) (RCA 6.5 RCM 12.4) 1939 to 1943 and 1945 to date Member firm of Young & Greenawalt, Chicago, Ill.; in the interim with CEC, USNR.

HARTFORD, FRED DAILEY (Assoc. M.) Santa Fe, N.Mex. (Age 57) (RCA 18.4 RCM 11.6) Aug. 1942 to date various positions with U.S. PRA, since Oct. 1945 as Highway Bridge Engr., Santa Fe, N.Mex.

HERB, EDWARD GEORGE, Washington, D.C. (Age 37) (RCA 3.3 RCM 6.4) Sept. 1933 to date with U.S. Engr. Dept., since Oct. 1945 Executive Asst., Dir. of Civ. Works, Chf. of Engrs.; Col., Corps of Engrs.

HOLLAND, ROY JOHNSON, Phoenix, Ariz. (Age 52) (RCA 7.0 RCM 11.0) 1929 to date with Arizona Highway Dept., since 1942 as Dist. Engr.

HUGHES, HOMER LITTLEFIELD, Bradenton, Florida. (Age 52) (RCA 6.5 RCM 11.6) May 1945 to date Designing and Sales Engr., Tampa (Fla.) Marine Repair Co.; previously with Bail, Horlon & Associates, Ft. Myers; with Constr. Dept., U.S. Navy; with McCloskey & Co.

JAHLSTROM, ILMAR OSCAR (Assoc. M.), Sacramento, Calif. (Age 46) (RCA 5.5 RCM 13.2) May 1930 to date Associate and, after June 1933, Senior Bridge Engr., California Dept. of Public Works.

JERVIS, WILLIAM HORACE (Assoc. M.) Sacramento, Calif. (Age 38) (RCA 1.1 RCM 11.0) July 1943 to date Chf., Embankment and Foundation Branch, U.S. Waterways Experiment Station, Vicksburg, Miss.; previously Chf., Soils Sec., Vicksburg Engr. Dist., U.S. Engr. Dept.

KING, CHARLES SOLIE, Helena, Mont. (Age 45) (RCA 1.0 RCM 7.0) Oct. 1941 to date with CAA, since July 1944 as Dist. Airport Engr.

KLINE, ROBERT PATTERSON, Buffalo, N.Y. (Age 39) (RCA 6.0 RCM 8.1) June 1938 to May 1942 and Jan. 1946 to date with U.S. Engr. Office, Pittsburgh, Pa., and Buffalo, N.Y., since Jan. 1946 being Chf., Contr. Div., Buffalo Office; in the interim Officer, Corps of Engrs., U.S. Army.

KORNACKER, FRANK JOHN, Chicago, Ill. (Age 44) (RCA 7.9 RCM 5.8) April 1946 to date Structural Engr. (private practice), Chicago, Ill.; previously with Greeley & Hansen, Chicago, Ill.; Arthur McKee Co., Cleveland, Ohio; with Clifford E. Paine, Cons. Engr., Chicago, Ill.

KUMAR, SARDARI LAL, Multan, Punjab, India. (Age 42) (RCA 11.5 RCM 8.1) Oct. 1926 to date with North Western Ry., Lahore, India, since Oct. 1942 as Executive Engr.

MILBANK, REGINALD VENN (Assoc. M.) Plainfield, N.J. (Age 42) (RCA 7.2 RCM 10.0) March 1940 to Jan. 1942 and April 1946 to date Res. Engr., Bethlehem Steel Co., Pottstown Pa.; in the interim, Lt. Comdr. CEC, U.S. Navy; Structural Engr., Johnson Drake & Piper.

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MORGENTHALER, FREDERICK LEONARD, JR., Harrisburg, Pa. (Age 38) (RCA 3.7 RCM 9.4) March 1946 to date Chf. Designer, Capitol Eng. Corporation, Dellsburg, Pa.; previously with USNR, finally as Planning Div. Officer; with Pennsylvania Dept. of Highways.

NICOL, THOMAS BRUCE (Assoc. M.), Sydney, Australia. (Age 50) (RCA 4.0 RCM 17.0) May 1921 to date Metropolitan Water, Sewerage & Drainage Board, Sydney, Australia, since 1937 as Deputy Engr. in Chf.

ORTIZ, JOSE PULIDO (Assoc. M.), Mexico, D. F., Mexico. (Age 40) (RCA 2.4 RCM 5.3) Nov. 1943 to date with Maritime Works, Mazatlan; previously with Mexican Navy.

PAVLO, ALEXANDER LEO (Assoc. M.), Brooklyn, N.Y. (Age 37) (RCA 0.3 RCM 9.0) Structural Engr., Aug. 1944 to date with Madigan-Hyland Cons. Engrs., Long Island City; previously with Leonard Constrs. Co.; with J. V. W. Reynders, Archt.-Engr., New York City.

PUGH, WILLIAM LINCOLN (Assoc. M.), Montreal, Quebec. (Age 53) (RCA 6.0 RCM 21.2) May 1937 to date various positions with Aluminum Co. of Canada, Ltd., Montreal, since Aug. 1945 being Asst. Chf. Engr.

ROBERTS, GILBERT, Glasgow, Scotland. (Age 47) (RCA 8.0 RCM 13.0) 1936 to date with Sir William Arrol & Co. Ltd., Glasgow, Scotland, since 1944 as Chf. Eng.

SCACCIAFERRO, SALVATOR JOHN (Assoc. M.) Newark, N.J. (Age 49) (RCA 3.2 RCM 21.1) Nov. 1926 to date Asst. Engr., Passaic Valley Sewerage Commrs., Newark, N.J.

SMITH, RALPH ALBERT (Assoc. M.) Chicago, Ill. (Age 42) (RCA 8.7 RCM 10.1) Jan. 1946 to date member of firm Consoer, Townsend & Associates, Cons. Engrs., Chicago, Ill.; previously Lt. Comdr., CEC, USNR; Executive Officer to Project Manager and later Chf. Engr., Consoer, Townsend & Quinlan and Battey & Childs.

STAVEN, JULIAN, Rapid City, S.Dak. (Age 47) (RCA 5.8 D 7.1) Feb. 1944 to date Cons. Engr., Rapid City, S.Dak.; previously with U.S. Army Engrs., Rapid City.

STEPHENSON, THOMAS JAMES, Portland, Ore. (Age 58) (RCA 6.4 RCM 23.4) Sept. 1945 to date Civ. Engr., Bridge Dept., Portland, Ore.; previously Regional Water Facilities Engr., U.S. Dept. Agriculture; Civil Engr. Japanese War Relocation Camp Jerome, Idaho; private practice.

STURM, JOHN THEODORE, JR., Webster Groves, Mo. (Age 40) (RCA 4.1 RCM 7.0) Jan. 1932 to date with Office of Div. Engr., Upper Mississippi Valley Div., U.S. Engr. Office, since Aug. 1945 as Prin. Engr.

SWEET, JAMES SIMEON (Assoc. M.), Douglaston, N.Y. (Age 45) (RCA 2.8 RCM 6.6) Jan. 1940 to date with U.S. Weather Bureau, since Oct. 1941, Hydroelectric Engr., Bureau Regional Office No. 1, New York, N.Y.

WALRAVEN, WESLEY BURNHAM, Springfield, Ill. (Age 51) (RCA 1.9 RCM 27.4) June 1924 to April 1942 and March 1946 to date Engr., Springfield San. Dist. and Consulting Engr.; in the interim, Col., Corps of Engrs., U.S. Army.

WESTBY, LEONARD ALEXANDER, San Antonio, Tex. (Age 38) (RCA 8.4 RCM 6.6) Jan. 1946 to date Civ. Engr., San Antonio, Tex.; previously with Dept. of Agriculture, SCS, Research Div., finally as Hydr. Engr.

YOUNG, LEWIS ALARIC (Assoc. M.), Bogota, Colombia. (Age 40) (RCA 3.5 RCM 9.1) Nov. 1942 to Dec. 1943 and March 1946 to date with Office of Inter-American Affairs, Div. of Health and Sanitation, Bogota, Colombia; in the interim, Capt. to Lt. Col., U.S. Army assigned to same office; previously Associate Engr. and Acting Chf. Engr., Kansas Board of Health.

APPLYING FOR ASSOCIATE MEMBER

ALBERTIS, ALEXANDER JOHN, Athens, Greece. (Age 37) (RCA 7.7) 1945 to date with Shelter Section, UNRRA, previously private practice, Eng. and Contracting; with Hellenic Navy.

ARMENTROUT, WILLIAM FRANCIS (Junior), Birmingham, Ala. (Age 36) (RCA 10.6) April 1946 to date Engr., Hackney Steel Co., Birmingham, Ala.; previously Engr. and Estimator, W. F. Jackson Co., Birmingham, Ala.; Lt. to Lt. Col., U.S. Army Ordnance Dept.

ATKINS, ROBERT BOYER (Junior) Arlington, Va. (Age 35) (RCA 6.8 RCM 3.0) April 1941 to date Lt. (j.g.) to Comdr. CEC, USNR; previously with War Dept., Radford (Va.) Ordnance Works.

BARBER, JOHN THOMAS (Junior) Santa Fe, N.Mexico. (Age 34) (RCA 1.0) April 1946 to date Instrumentman and Inspector, New Mexico Highway Dept.; previously Surveying Officer, 5th Naval Constr. Brigade; Officer in Charge, 593 Constr. Bn., Guam; Public Works Officer, Ipitanga Naval Air Facility, Brazil; Levelman and Magnetometer Operator, Socony-Vacuum Oil Co., Venezuela.

BEARD, EARL GILMAN, JR. (Junior) Park Ridge, Ill. (Age 35) (RCA 6.0 RCM 6.1) Jan. 1939 to Oct. 1942 and Dec. 1945 to date Asst. Subway Engr., Chicago Dept. of Subways and Superhighways; in the interim, Lt., CEC, USNR.

BERNSTEIN, M. JACK (Junior), Denver, Colo. (Age 32) (RCA 4.8) May 1938 to May 1941, Jun. Engr. and Feb. 1946 to date Engr., Bureau of Reclamation, Denver, Colo.; in the interim, Lt., etc., to Lt. Col., Corps of Engrs., U.S. Army.

BISHOP, JOHN REID (Junior), Granville, Ill. (Age 35) (RCA 1.6) July 1941 to July 1942 and Feb. 1946 to date, Land Bank Appraiser; Asst. and (1946) Associate Engr. Appraiser; in interim with U.S. Navy.

BONNER, JOHN FOSTER (Junior) San Francisco, Calif. (Age 32) (RCA 4.9) June 1937 to Aug. 1941, Hydrographer; Jan. 1946 to date Asst. Engr., Pacific Gas and Elec. Co., San Francisco, Calif.; in the interim with CAC, AA, with U.S. Army, finally as Lt. Col.

CARROLL, RUPERT FRANCIS, Raymondville, Tex. (Age 36) (RCA 5.1 RCM 4.1) June 1937 to date with Humble Oil & Refining Co., Texas since June 1943 as Office Civ. Engr., Willamar Dist.

CARTER, ELDEN WUEST (Junior) Portland, Ore. (Age 35) (RCA 3.4 RCM 2.7) Jan. 1946 to date Engr. with C.E. Carter Cons. Civ. Engr., Portland, Ore.; previously with CEC, finally as Lt. USNR; with U.S. Bureau of Reclamation.

CHENOWETH, THOMAS EDWIN, Kansas City, Mo. (Age 37) (RCA 9.0 RCM 3.4) Sept. 1945 to date Utilities Engineer, Dept. of Public Works, Kansas City, Mo.; previously with Pratt & Whitney Aircraft Corporation of Missouri.

CHICK, FRANK HEWES, Everett, Wash. (Age 31) (RCA 2.1 RCM 0.5) July 1941 to May 1944 and June 1946 to date Associate Engr., U.S. Engr. Dept., Anchorage, Alaska; in the interim, Asst. Engr., U.S. CAA; Associate Engr., U.S. Army, Seattle Port of Embarkation and U.S. Naval Air Station, Whidby Field, Wash.

COOPER, SAMUEL DALE, Knoxville, Tenn. (Age 33) (RCA 8.7) June 1946 to date Member of firm, Cooper & Perry Archts. and Engrs.; previously, Engr., Landry & Matthes, Hattiesburg, Miss.; Engr. and Special Asst. to Chf. Engr., Alabama Dry Dock & Shipbuilding Co., Mobile, Ala.

DENISON, CHARLES ROGER, Palmyra, N.J. (Age 40) (RCA 4.3 RCM 2.0) Feb. 1946 to date Senior Engr., U.S. Maritime Comm., previously with Corps of Engrs., U.S. Army, finally as Lt. Col.; with Army Engr.

DOBBIN, JOHN RALPH (Junior), Kansas City, Mo. (Age 34) (RCA 5.7) Oct. 1942 to date Associate Engr., U.S. Engr. Office, Kansas City Dist.; previously, Designer and Inspector for Gentry, Vaskamp & Jos. W. Radotinsky Archt.-Engrs.; Rodman, Instrumentman, and Asst. Engr., Kansas Highway Comm.

DONNELL, ALTON PARKER, Oak Ridge, Tenn. (Age 30) (RCM 3.5) June 1940 to date with Corps of Engrs., U.S. Army, at present administering technical work, Manhattan Engr. Dist.

DOOLITTLE, RUSSELL COMBER, Jr. (Junior), San Diego, Calif. (Age 29) RCA 2.2 April 1946 to date Engr., San Diego Gas & Dec. Co.; previously, Engr., Jack W. Brem Co.; Senior Engr. Aide, California Highway Comm.; with FPHA, Engr., W. A. Klinger, Inc.

ELKOW, MILTON OMELIAN (Junior), Southgate, Kan. (Age 33) (RCA 4.0) April 1937 to May 1942 and Nov. 1945 to date with Moran, Proctor, Freeman & Mueser, Cons. Foundation Engrs., since Nov. 1945 as Design and Res. Engr.; in the interim, Reserve Officer, CEC, U.S. Navy.

ERSKINE, BAYARD CASS, Knoxville, Tenn. (Age 32) (RCA 4.7) Nov. 1935 to-date with TVA, since April 1943 as Associate Office Engr., Design Dept., Knoxville.

ESCOBAR, JOSE LEOPOLDO, Guatemala City, Guatemala. (Age 33) (RCA 4.6) Oct. 1945 to June 1946 graduate student, Princeton Univ.; previously, Engr. of Location for Pan-American Highway; Asst. Engr., Highway Dept., Guatemala.

FORD, DWAYAIN KEENE (Junior) Seattle, Wash. (Age 35) (RCA 3.1 RCM 2.6) June 1946 to date Civ. Engr., CAA; previously, Hydraulic Engr., U.S. Engr. Dept., Seattle, Wash.; Lt. to Major, Corps of Engrs., U.S. Army.

GRAMBOW, RICHARD FREDERIC, Sausalito, Calif. (Age 30) (RCA 5.5 RCM 1.0) June 1946 to date Engr., Bechtel Bros. McCone Corporation, San Francisco, Calif.; previously, Asst. Naval Archt. and Naval Archt., Marinship Corporation, Sausalito, Calif.; with Navy Yard, N.Y.

GREEN, WILLIAM WELLS (Junior), Corpus Christi, Tex. (Age 34) (RCA 4.2) Dec. 1944 to date Office Engr., Blucher Eng. Co.; previously, inspector and Office Engr. with City of Corpus Christi.

GUIZA, DONATO ENRIQUE (Junior), New Orleans, La. (Age 32) (RCA 2.3 RCM 3.7) Sept. 1939 to date with Boh Bros. Constr. Co., Gen. Contr., New Orleans, La., since Jan. 1943 as Engr.-Supt.

HAMPTON, JOHN ELLERTON LEWIS, Durban, Natal, S.Africa. (Age 33) (RCA 8.4) Sept. 1937 to date various positions with City and Water Engr. Dept., Durban Corporation, Durban, S. Africa.

HARDY, ROBERT MACDONALD, Edmonton, Alberta, Canada. (Age 39) (RCA 6.8 RCM 4.5) 1930 to date with Univ. of Alberta engaged since May 1946 as Professor of Civ. Eng., and Acting Dean, Faculty of Applied Science.

HENKE, LOUIS, JR., Helena, Mont. (Age 29) (RCA 4.2) May 1946 to date Bridge Designer, Montana Highway Dept., Helena, Mont.; previously Ensign and Lieut. (j.g.) CEC, USNR; Structural Designer, Office Eng. Div., Panama Canal, Balboa Heights, Canal Zone.

HESPENHEIDE, HENRY AUGUST, Baltimore, Md. (Age 33) (RCA 4.4 RCM 2.0) May 1941 to date Asst. Engr., later Associate Engr., U.S. Engr. Office, Baltimore, Md., and previously at Winchester and Norfolk, Va.

HESS, JAMES KENNETH (Junior), New Orleans, La. (Age 31) (RCA 4.5) Sept. 1945 to date with Jones & Laughlin Steel Corporation as estimator and designer; previously with U.S. Army, finally as Capt., Corps of Engrs.

HONNOLD, HAROLD LELAND, JR. (Junior), Berkeley, Calif. (Age 31) (RCA 3.4 RCM 1.0) Dec. 1942 to date 2nd Lt., 1st Lt., and later Capt., U.S. Marine Corps Reserves; previously with U.S. Engr. Dept., Honolulu Dist.

JASKAR, ADE EUGENE (Junior) Seattle, Wash. (Age 34) (RCA 3.9 RCM 2.0) Feb. 1938 to date with U.S. Engr. Dept., since Feb. 1941, Jun. to Asst. Dist. Geologist.

KEATING, BERNARD JOSEPH, Philadelphia, Pa. (Age 40) (RCA 10.2) Sept. 1945 to date Structural Designer, E. I. du Pont de Nemours & Co., Inc., Wilmington, Del.; previously with Albright & Friel, Inc., Cons. Engrs., Philadelphia, Pa.; with Philadelphia Transportation Co.; with Process Piping, Publicker Industries, Inc., Philadelphia, Pa.

KEELEY, JOSEPH WENDELL, Norman, Okla. (Age 38) (RCA 9.5 RCM 4.0) Sept. 1941 to date with Univ. of Oklahoma, since Sept. 1945 as Associate Prof.

KINGSTON, JOSEPH ROY, JR. (Junior) Franklin, La. (Age 28) (RCA 4.0 RCM 0.5) Jan. 1946 to date Member of firm and Mgr., Burke & Kingston, Franklin, La.; previously Ensign and Lt. CEC, USNR; various positions with Modjeski and Masters, Consulting Engrs.

KISDUCAK, FRANK STEVE (Junior) Anchorage, Alaska. (Age 34) (RCA 6.4) Nov. 1940 to date with CAA, Seattle, Wash., and (at present) Asst. Civ. Engr., Anchorage, Alaska.

KLASING, WALDEMAR JOHN (Junior), Webster Groves, Mo. (Age 34) (RCA 4.9) Sept. 1941 to date successively 1st Lt., Capt., and Major, U.S. Army.

KOCHTITZKY, OSCAR WILBUR, JR. (Junior), Knoxville, Tenn. (Age 34) (RCA 7.2 RCM 4.0) March 1934 to date with TVA, since July 1945 as Associate Engr.

KRAVATH, FRED FRANK, Philadelphia, Pa. (Age 32) (RCA 7.9 RCM 2.0) Aug. 1941 to June 1946 with CEC, USNR, at present Commdr. CEC, U.S. Navy.

KURZWEIL, ARTHUR COLUMBUS, Berkeley, Calif. (Age 40) (RCA 5.7 RCM 1.1) July 1945 to date Associate Engr., Kaiser Engrs., Inc., Oakland, Calif.; previously, Asst. Prof. of Civ. Eng., Univ. of California; Asst. Prof. of Civ. Eng., Univ. of Calif.; Asst. Prof. of Civ. Eng., Univ. of Maryland with Consolidated Aircraft Corporation, San Diego, Calif.

LAMM, MAX FRANCIS (Junior), St. Louis, Mo. (Age 36) (RCA 5.6 RCM 1.6) Aug. 1938 to Sept. 1942 and April 1946 to date with U.S. Engr. Office, St. Louis, Mo.; in the interim, Lt. to Lt. to Capt. U. S. Army Engrs.

LANGENBACH, WILLIAM OLIVER, Glendale, Calif. (Age 37) (RCA 7.9) Nov. 1933 to date with California Div. of Highways, since April 1942 as Asst. Bridge Engr., Bridge Dept.

LEMCKE, EWALD MAX, Anaheim, Calif. (Age 39) (RCA 9.2 RCM 3.6) Feb. 1941 to date Maintenance Engr. and since Feb. 1943, Engr., Orange County Joint Outfall Sewer Dist.

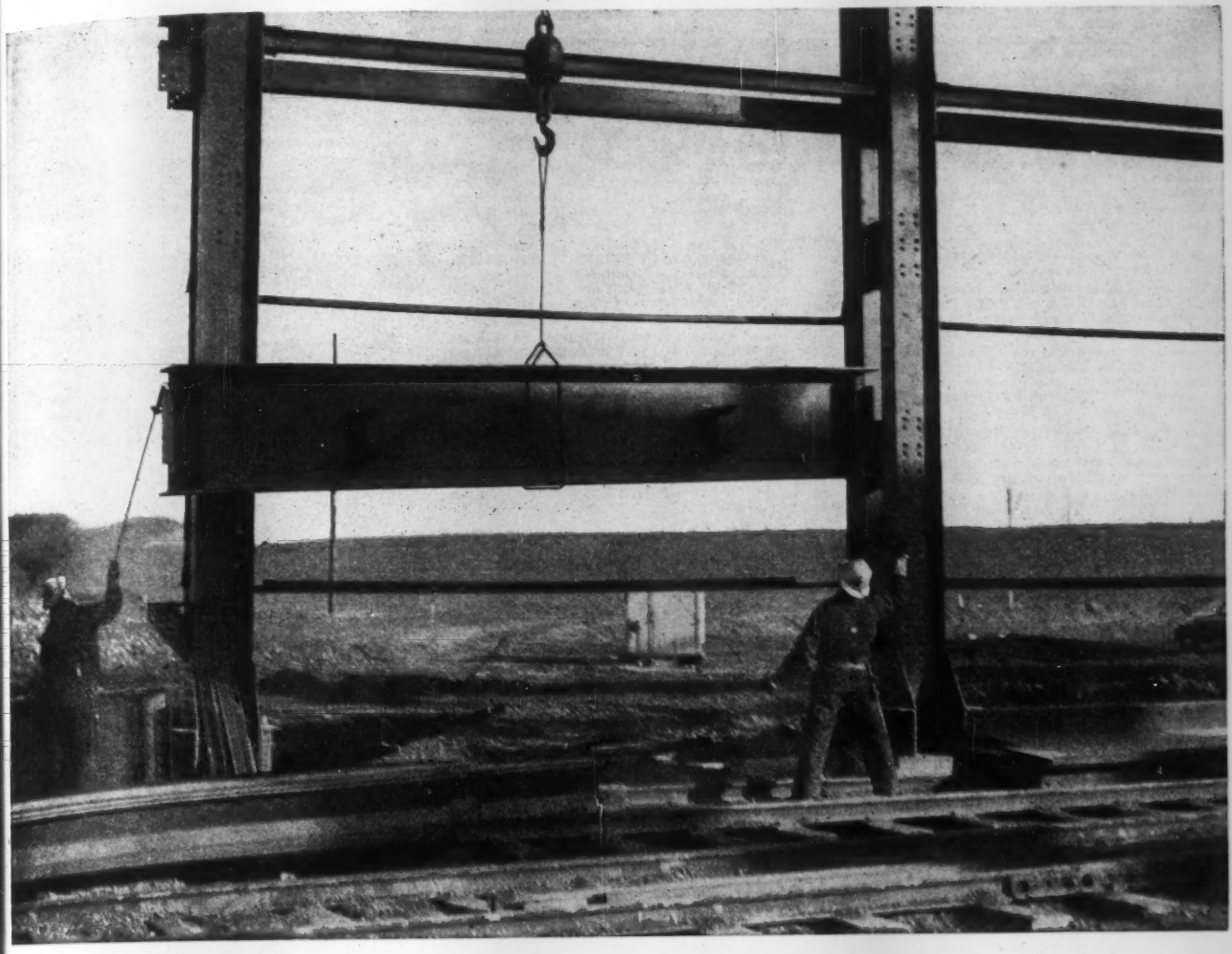
LYDER, WILFRED DEMPSTER, Point Fortin, Trinidad. (Age 45) (RCA 14.4 RCM 2.3) 1932 to date Field Engr., United British Oilfields, Ltd., Trinidad.

MCINTYRE, WILLIAM ALBERT, San Gabriel, Calif. (Age 42) (RCA 8.3 RCM 5.8) Feb. 1930 to Dec. 1943 and Jan. 1946 to date Jun., Asst., and Associate Bridge Engr., California Div. of Highways, Bridge Dept.; in the interim, Lt. to Lt. Comdr., CEC, U.S. Navy.

MCLEA, DUNCAN KENNEDY (Junior), Pritoria, S. Africa. (Age 34) (RCA 5.7) March 1939 to date with National Road Board, South Africa, since Nov. 1942 Engr., at present in charge of Orange Free State Dist. Officer.

MCMORRAN, JOHN BURCH, Binghamton, N.Y. (Age 47) (RCA 24.3) Nov. 1927 to Dec. 1942 and April 1946 to date various positions with N.Y. State Dept. of Public Works, Syracuse, N.Y.; in the interim, Officer, Corps of Engrs., U.S. Army.

MARDORF, ERWIN CARL, Talladega, Ala. (Age 35) (RCA 0.6 RCM 6.2) Jan. 1942 to date with U.S. Engr. Office, since Jan. 1946 being Chief, Contract Termination Branch, Birmingham Area; previously with Concrete Materials & Construction Co., Cedar Rapids, Iowa.



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MAY, MARVIN CLARK (Junior) Albuquerque, N. Mex. (Age 32) (RCA 3.3) March 1945 to date Asst. Prof. Univ. of New Mexico; previously with U.S. Engineers office, Albuquerque, N.Mex., as Engr., Civil P-1 & P-2; also with U.S. Bureau of Reclamation.

MESMER, JOHN FREDERICK, North Platte, Nebr. (Age 39) (RCA 4.8 RCM 2.8) July 1934 to date with Platte Valley Public Power and Irrigation Dist., since Nov. 1943 as Hydr. Engr.

MOONEY, WILLIAM, Detroit, Mich. (Age 56) (RCA 27.8) 1946 to date Constr. Engr., Taylor Gaskin Co. of Detroit, Mich.; previously, Industrial Engr., Smith, Hinchman & Grylls; Field Supt., Giffels & Vallet Co.

MORGAN, LLOYD HAROLD, Olympia, Wash. (Age 43) (RCA 10.5) Feb. 1927 to date with Washington State Dept. of Highways, since June 1942 as Soils Engr.

MUELLER, RALPH WILLIAM (Junior), Mobile, Ala. (Age 34) (RCA 4.0 RCM 2.0) Sept. 1938 to date with U.S. Engr. Office, Mobile, Ala., as Jun. Engr. and (since July 1940) Engr.

NEWSOME, RICHARD CECILE (Junior) Lolita, Tex. (Age 33) (RCA 5.2) July 1938 to July 1942 and Dec. 1945 to date with Humble Oil & Refining Co., since Dec. 1945 as Civ. Engr.; in the interim, with CEC, U.S. Navy.

OHMAN, RICHARD NELSON (Junior) Hopkins, Minn. (Age 34) (RCA 6.0 RCM 1.3) Aug. 1941 to March 1944, Draftsman, and April 1944 to date Inspector, Northern Pacific R.R.; previously with WPA.

O'REILLY, ANDREW JOSEPH, JR., Queens Village, N.Y. (Age 31) (RCA 5.7 RCM 1.2) Nov. 1945 to date Engr. with Frederick L. Cranford, Inc.; previously Lt. (j.g.) USNR, being Civ. Engr. (overseas); Field Engr. with contractors for dry dock, Brooklyn Navy Yard.

POWERS, KENNETH LAWRENCE (Junior), Altus, Okla. (Age 34) (RCA 4.1) June 1941 to date on Altus Okla. Project, U.S. Bureau of Reclamation, since Aug. 1943 as Materials Engr.

PURANDARE, NARAHARI NILKANTH, Bombay, India. (Age 31) (RCA 2.5 RCM 4.9) April 1943 to date Cons. Engr. and Structural Designer, private practice, Bombay, India, previously Member and later Sole Proprietor, M/s Acharya & Co., Engrs. & Contractors, Bombay, India.

REICHEL, ROBERT CHRISTOPHER, Danvers, Ill. (Age 31) (RCA 2.4 RCM 5.2) May 1946 to date Architectural Field Representative, Portland Cement Association, Chicago, Ill.; previously, Lt. (j.g.), Lt., and Lt. Col., CEC, USNR; Civ. Engr., Bureau of Yards and Docks, U.S. Navy; Research, Insulation Board Inst.

ROBERTSON, DAN DUANE (Junior), Menlo Park, Calif. (Age 35) (RCA 8.2) Nov. 1938 to Apri 1942 and Sept. 1945 to date Gen. Contr., as Lindley Constr. Co.; in the interim, Project Mgr., L. Cedrick Macabee, Engrs.; Engr., Eng. Design, Inc., San Francisco, Calif., with H. J. Brunnier, Archt.-Engr., San Francisco.

RYAN, ALBERT JOHN, Brooklyn, N.Y. (Age 29) (RCA 2.3 RCM 0.5) Jan. 1946 to date Deputy Dist. Engr. (Adm.) Philadelphia Engineer Dist.; previously, 4½ years with U.S. Army, finally as Major.

SAUER, VICTOR WOODROW (Junior), Oakland, Calif. (Age 35) (RCA 5.8 RCM 0.5) March 1946 to date with Dept. of Sanitation and Drainage, Oakland, Calif., since Jan. 1941 as Asst. Civ. Engr.; in the interim, Lt. to Major, San. Corps., U.S. Army.

SCHUCKER, GEORGE WAYNE (Junior), Baltimore, Md. (Age 34) (RCA 9.6) Jan. 1936 to June 1941 and Oct. 1945 to date with Baltimore Health Dept., since April 1940 as Director, Bureau of Environmental Hygiene; in the interim, 1st Lt. to Major, Corps of Engrs., U.S. Army.

SCHULTZ, EDWARD AUGUST, Vicksburg, Miss. (Age 34) (RCA 3.7 RCM 5.1) Oct. 1934 to April 1943 and Jan. 1946 to date various engagements with U.S. Waterways Experiment Station, Vicksburg, Miss., finally as Asst. Chf. of Hydrodynamics Branch; in the interim with CEC, U.S. Navy.

SCHWARTZ, HENRY JOHN, Little Rock, Ark. (Age 37) (RCA 2.2) Aug. 1936 to date with U.S. Engr. Dept., since Jan. 1946 as Associate Engr.

SHOBER, WILLIAM BRIDGEFORD, Middletown, Ohio. (Age 30) (RCA 6.6) March 1941 to Dec. 1942 and Jan. 1946 to date Sales Engr., Armco International Corporation, Middletown, Ohio; in the interim, 1st Lt., Corps of Engrs., U.S. Army.

SMITH, MARVIN LUKE, Bethlehem, Pa. (Age 37) (RCA 8.0) Oct. 1944 to date as Major, U.S. Public Health Service, being San. Engr. at present with District No. 1, New York, U.S. Public Health Service; previously with Chicago Dist. Office.

SMITH, RICHARD ALONZO (Junior), Arlington, Va. (Age 29) (RCA 4.5) July 1942 to date (except Dec. 1945 to March 1946 with Chief of Engineers, U.S. Army, Washington, D.C., as Engineer, P-3) with USN, since March 1946 Lt., Bureau of Ships.

SPERO, MICHAEL ANTHONY (Junior), Denver, Colo. (Age 36) (RCA 3.5 RCM 1.4) at present with U.S. Bureau of Reclamation, Denver, Colo.; July 1941 to Sept. 1942 and Jan. to May 1946, Asst. Structural Engr., Navy Yard, Boston, Mass.; in the interim, with Corps of Engrs., U.S. Army.

STEVENS, WILLIAM GEORGE, JR., Philadelphia, Pa. (Age 41) (RCA 12.9 RCM 2.4) March 1946 to date associate with Thomas E. Bruder, Cons. Engr., Philadelphia, Pa.; previously with Morton C. Tuttle Co., Boston, Mass.; with U.S. Maritime Comm.

TAYLOR, GUY HARVEY (Junior), Seattle, Wash. (Age 31) (RCA 5.2 RCM 2.4) Dec. 1945 to date with Truscon Steel Co., Seattle, Wash., as Branch Manager; previously with U.S. Army, finally as Lt. Col., Corps of Engrs.

UCROS-GUZMAN, IGNACIO, Bogota, Colombia. (Age 32) (RCA 6.7 RCM 0.7) July 1945 to date Engr., Parsons, Brinckerhoff, Hogan & MacDonald of New York in Bogota; previously as Engr. with Armco Colombiana; Engr., Dept. of Public Works, Bogota, Colombia.

WEBER, ALFRED HENRY, Rock Island, Tenn. (Age 37) (RCA 3.1 RCM 1.2) April 1936 to date with Constr. Dept., TVA, since July 1945 as Civ. Eng.

WERNER, CARL ARTHUR, Sacramento, Calif. (Age 36) (RCA 6.5 RCM 2.5) Aug. 1940 to Oct. 1942 and Nov. 1945 to date Asst. Hydr. Engr., State Div. of Water Resources, Sacramento, Calif.; in the interim, Lt., CEC, USNR.

WHISENAND, WALTER BERNARD, Los Angeles, Calif. (Age 43) (RCA 7.0) May 1938 to Sept. 1940 and Jan. 1945 to date Civ. Engr. (private practice); in the interim with U.S. Army Air Force.

WILLIAMS, ROGER HARGREAVES (Junior) Corvallis, Ore. (Age 35) (RCA 2.6 RCM 3.9) June 1938 to July 1939 and Sept. 1940 to date with Corps of Engrs., U.S. Army, since Jan. 1945 as Lt. Col.

APPLYING FOR JUNIOR

CUNNINGHAM, RICHARD JOSEPH, Omaha, Nebr. (Age 29) (RCA 1.3) Dec. 1945 to date Structural Draftsman, Design Branch, U.S. Engr. Dist. Office, Omaha, Nebr., previously U.S. Navy; with Missouri Board of Health.

EULER, LOUIS MOHR, Mt. Ranier, Md. (Age 25) June 1941 to Dec. 1942, Asst. to Div. Engr., Acting Div. Engr., and Jan. 1946 to date Asst. Div. Engr., Washington Suburban San. Comm.; in the interim, Ensign to Lt., CEC, USNR.

HARROLD, STANLEY COOPER, Bristol, Va. (Age 28) Feb. 1946 to date Apprentice Engr., Virginia Dept. of Highways.

JOB, RICHARD DALE, Middletown, Ohio. (Age 24) March 1945 Engr., American Rolling Mill Co., Middletown Ohio; previously, Jun. Hydr. Engr., TVA, Knoxville, Tenn.

JOHNSON, ARMAND STANFORD, Minneapolis, Minn. (Age 27) Dec. 1945 to date Instructor, Univ. of Minn.; previously Lt. (j.g.) USNR; Jun. Engr. Draftsman, Flood Control Sec., U.S. Army Engr. Office, Albuquerque, N.Mex.; Computer, S.Dak. Highway Dept.

JOHNSON, GORDON ENOCH, Gary Lake, Ind. (Age 25) May 1946 to date with Henschien, Everdo & Crombie, Chicago, Ill.; previously with U.S. Navy; Jun. Structural Engr., American Bridge Co., Gary, Ind.

JONES, GLYNDWR MALCOLM, Lake Waitake, North Olago, New Zealand. (Age 23) April 1945 to date with Public Works Dept., Hydro-Elec. Branch, since Jan. 1946 as Departmental Officer, Black Jacks Point.

KELLY, EUGENE THOMAS, Nashville, Tenn. (Age 25) March 1946 to date Chainman and Rodman with Eng. Dept., Nashville, Tenn., previously with U.S. Army; student.

KINDERSLEY, CHARLES ST. BARBE, Somerset, England. (Age 24) Aug. 1943 to date with Sir Alexander Gibb, Westminster, London. since 1946 as Jun. Engr.

LOPEZ, RAMIEREZ, JORGE EMILIO, Hato Rey Puerto Rico. (Age 25) (RCA 0.8) Oct. 1945 to date Civ. Engr., Puerto Rico Development Co.; previously, post-graduate student, Mass. Inst. Tech.; Instructor in Civ. Eng., Univ. of Puerto Rico.

LYTLE, WILLIAM FULLENWIDER, Urbana, Ill. (Age 29) Oct. 1945 to date Special Research Asst., Univ. of Illinois; April to June 1942 Jun. Engr. with U.S. Engrs., Chicago; in the interim with U.S. Army.

O'MARA, ARTHUR JAMES, JR., Trenton, N.J. (Age 25) (RCA 2.0) April 1946 to date Engr., Belle Co., Trenton, N.J.; previously Engr., Turner Constr. Co., Princeton, N.J.; with Seabees.

ROGERS, RAYMOND MARVIN, San Francisco, Calif. (Age 30) March 1946 to date San. Engr., Clyde C. Kennedy, Cons. Engr.; previously with CAC, U.S. Army.

RUNNELLS, DAVID LESLIE, JR., Grand Rapids, Mich. (Age 26) June 1946 to date Sales Engr., S. P. Boland Co., Grand Rapids, Mich.; previously, Draftsman-Designer, American Boxboard Co., Grand Rapids; Eng. Officer, Submarine Service, U.S. Navy.

SAGAR, THIRUVETHI PREM, Salt Lake City, Utah. (Age 22) Jan. 1946 to date graduate student, Univ. of Utah; previously in charge of Roads Lab., Univ. of Madras, India.

SAMAD, MOHAMED ABDUS, Salt Lake City, Utah. (Age 25) Jan. 1946 to date graduate student, Univ. of Utah; previously with Public Works Dept., Madras, India.

STRAUSSER, HOWARD SAMUEL, JR., Reiffton, Pa. (Age 25) Sept. 1945 to date Structural Engr., Gilbert Associates, Inc., Reading, Pa., previously Aircraft Eng. Officer and Aerial Navigator, U.S. Army.

TAM, JAMES SAU KEONG, Cambridge, Mass. (Age 27) (P 4.0) at present student, Harvard Univ.; previously with U.S. Army; with Hawaiian Elec. Co.

TAMA, GERARDO, Cali, Columbia, S.A. (Age 27) (RCA 1.2) June 1945 to date Field Engr. for Parsons, Brinckerhoff, Hogan & Macdonald, Cons. Engrs., New York City; previously Field Engr., Ecuadorean Development Corporation; Location Engr., Obras Publicas del Guayas, Ecuador.

WEINBERG, CHARLES LIPPE, New York City. (Age 25) (RCA 2.4) May 1946 to date Rodman with A. A. Johnson Corporation, Long Island City, N.Y.; previously with CEC, USNR, finally as Lt.

1942 GRADUATE

CASE SCHOOL OF APPLIED SCI. (B.S.C.E.)

	Age
BARTLETT, WESLEY JAMES	(26)

1943 GRADUATE

VA. MIL. INST. (B.S.C.E.)

FREEMAN, ALVIN ZELL	(24)

1944 GRADUATES

ALA. POL. INST. (B.C.E.)

LITTLE, ALTON SCOTT	(27)

BROOKLYN POL. INST. (B.S.C.E.)

STAMATAKY, JOHN HARRY	(23)

CORNELL UNIV. (B.S.C.E.)

REIDY, ROBERT ABELL	(23)

N.C. STATE COLL. (B.C.E.)

LAMBETH, JAMES BRANTLEY	(22)

WORCESTER POL. INST. (B.S.C.E.)

BROWN, PHILIP PROCTOR	(24)

1945 GRADUATES

UNIV. OF MINN. (B.S.C.E.)

HOYT, KENNETH DONALD	(22)

UNIV. OF OKLA. (B.S.C.E.)

PATTERSON, SIDNEY WINFIELD	(25)

1946 GRADUATES

UNIV. OF ARIZ. (B.S.C.E.)

NEWLIN, PHILIP BLAINE	(23)

UNIV. OF ARK. (B.S.C.E.)

FORD, JAMES LEE	(26)

UNIV. OF CALIF. (B.S.C.E.)

CALDERA, DAYTON JOSEPH	(22)
DESMOND, JAMES STEPHEN	(27)
GRISEMER, CHARLES HENRY	(21)
LOUIS, MAN GOO	(31)
MAYFIELD, ALLISON DUNCAN	(28)
MURDOCH, NORMAN	(20)
PECK, EVERETT BURR	(25)

UNIV. OF COLO. (B.S.A.E.)

THORNBERRY, MARGIE JEAN	(21)

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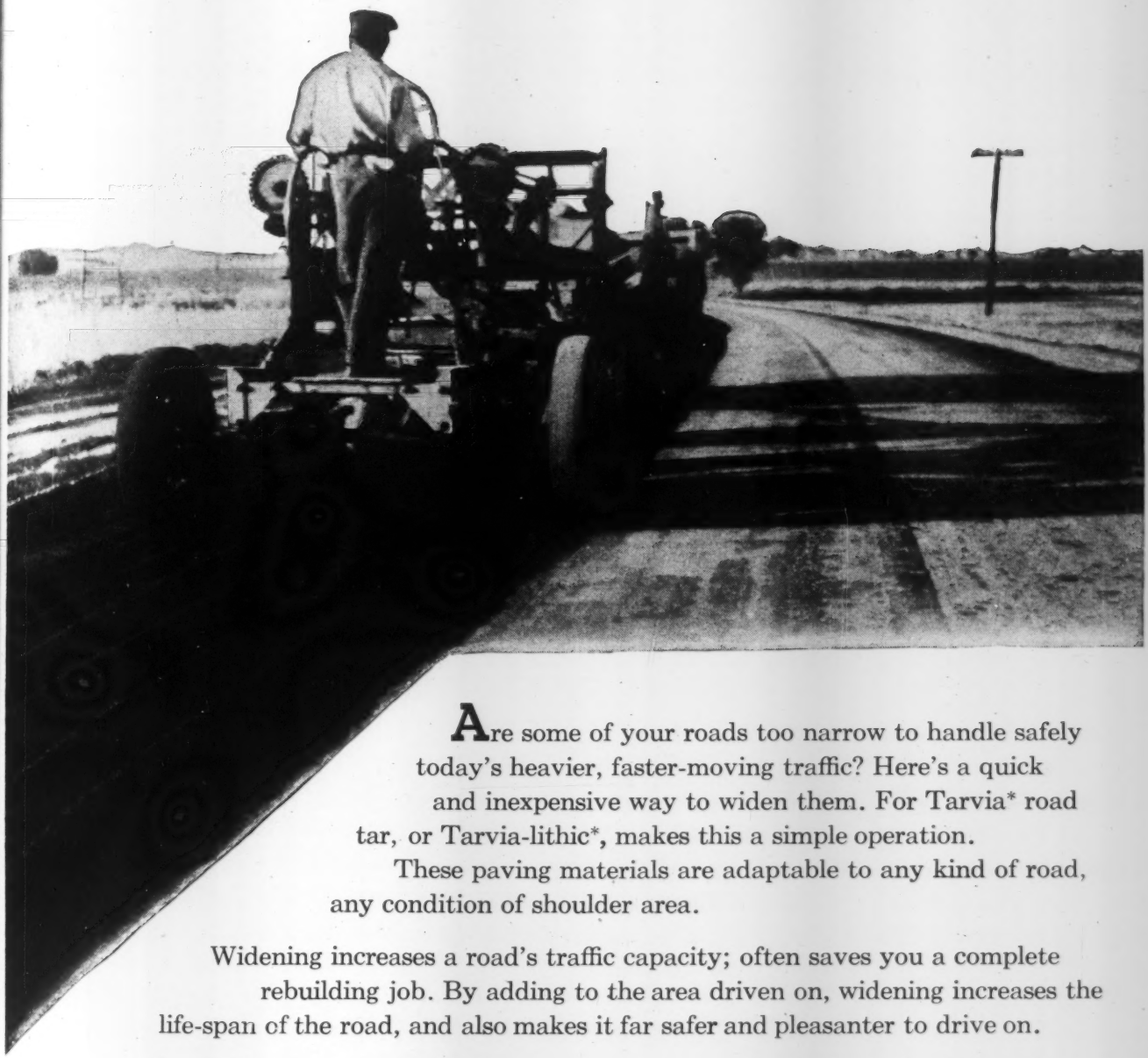

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CHIPMAN, ROBERT DAVIS (20)
MCALLISTER, EUGENE (20)
WILLIAMS, JACK RAYMOND (23)
WILSON, WINNIFRED LOUISE (20)

CORNELL UNIV.
(B.S.C.E.)

STEINBERG, MALCOLM LAWRENCE (20)

UNIV. OF ILL.
(B.S.C.E.)

FRANK, NEAL HENRY (27)

IOWA STATE COLL.
(B.S.C.E.)

ARMSTRONG, WILLIAM JAMES (20)
BOVEE, JOHN EDWIN (24)
FORBES, FRANK FIELD (22)
HANSEN, LYLE ANDREW (20)
HARLAND, JAMES WALLACE (21)
HAYWARD, RUSSELL JOHN (20)
LARSEN, MELVIN BURDETTE (22)

KANS. STATE COLL.
(B.S.C.E.)

SANDERSON, LEROY FRANCIS (27)

UNIV. OF KANS.
(B.S.C.E.)

STONG, HILDRETH LEWIS (20)

MICH. STATE COLL.
(B.S.C.E.)

MCNICOL, WARREN WILLIAM (26)

UNIV. OF MINN.
(B.S.C.E.)

BENZICK, ALLEN BRADFORD (24)
MAGOTA, SHUJI (22)
STAHL, ADRAIN KASPER (27)

MARQUETTE UNIV.
(B.S.C.E.)

REISENBUECHLER, CARL JOHN (22)

UNIV. OF MO.
(B.S.C.E.)

GARRISON, HOWELL BAKER (27)
HYDE, EARL THOMAS, JR. (28)
ROBINSON, WILLIAM KIRLEY (21)

COLL. OF CITY OF NEW YORK
(B.C.E.)

ROSENBERG, SHELDON MAURICE (20)

N.C. STATE COLL.
(B.C.E.)

STROUD, JOSEPH JAMES (28)

UNIV. OF OKLA.
(B.S.C.E.)

RODGERS, JOSEPH LEE, JR. (22)

RENS. POL. INST.

AMBROSY, CALMAN JOSEPH, JR. (20)

TEX. TECH. COLL.
(B.S.C.E.)

CALENTI, JORGE EMILIO COLON (22)

UNIV. OF TEX.
(B.S.C.E.)

BYERS, ROBERT EDGAR (29)

VA. MIL. INST.
(B.S.C.E.)

SARMIENTO, JORGE FERNANDO (20)

WASHINGTON UNIV.
(B.S.C.E.)

VOLLMAR, LEWIS COLNON (22)

YALE UNIV.
(B.C.E.)

DESMOND, FRANK ARTHUR (22)
GLASSMAN, DAVID (20)
NUSS, EDWARD SYLVESTER (21)
SORENSEN, WILLIAM ALVIN (21)
STROUKOFF, OLEG (24)
THORFINNSON, STANLEY THEODORE (20)
TRUX, ROBERT LESLIE, JR. (25)
WALKER, URIEL OWEN (20)

The Board of Direction will consider the applications in this list not less than thirty days after the date of issue.

RECENT BOOKS

New books donated by the publishers and filed in the Engineering Societies Library, or in the Society's Reading Room. Notes regarding books are taken from the books themselves, edited by the staff of the Society or of the Library. Books in the Library may be borrowed by mail by Society members for a small handling charge.

AIRPORT PLANNING. By C. Froesch and W. Prokosch. John Wiley & Sons, New York; Chapman & Hall, London, 1946. 250 pp., illus., diagrs., charts, maps, tables, $11^1/_4 \times 8^1/_2$ in., cloth, $7. Airport problems are clearly and concisely analyzed from a fundamental and functional viewpoint. The purposes of the book are: (1) To indicate the proper relationship of landing facilities to communities or regions they are to serve; (2) to analyze the characteristics of aircraft which affect the planning and design of these facilities; and (3) to effect a proper balance between the airfield and buildings. Practical and detailed consideration is also given to airfield construction and lighting, building and hangar design, and the establishment and operation of special services.

ANALYTIC GEOMETRY AND CALCULUS, 2 ed. By H. B. Phillips. John Wiley & Sons, New York; Chapman & Hall, London, 1946. 504 pp., diagrs., tables, $8^1/_2 \times 5^1/_2$ in., cloth, $4.50. The object of this textbook is to present analytical geometry and calculus in the form and order in which these subjects are required for courses in science and engineering. Consequently, after a mere introduction of graphical representation, the first three chapters provide a complete elementary course in the fundamentals of the calculus, including integration as a process of summation. The succeeding chapters develop both subjects in a simple and logical manner.

APPLIED PHOTOGRAMMETRY, 4 ed. By R. O. Anderson. C. E. Hayes, Chattanooga 1, P.O. Box 882, Tenn.; apply Edwards Brothers, Ann Arbor (Mich.), 1946. 517 pp., illus., diagrs., charts, tables, $9^1/_4 \times 6$ in., cloth, $6. As in the previous editions of this book, the object is to present a clear, simple, but accurate method of calculating tilt of the aerial photograph. In this new edition has been incorporated the material contained in two other books by the same author—*Rigorous Analysis of the Scale Point and Tilt Formulas* and *Tilt of the Aerial Photograph by Graphical Resection*. The theory and demonstrations of the basic idea, the dropped perpendicular analogy, have been extended, with further derivations, to increase the accuracy of the result. Numerical examples and sample calculations have been used freely, adding to the practical value of the book.

(THE) ENGINEER IN SOCIETY. By J. Mills. D. Van Nostrand Co., New York, 1946. 196 pp., $8^1/_2 \times 5^1/_4$ in., cloth, $2.50. This group of essays, dealing with the relationship of scientists and engineers to the world society in which they function, covers a variety of topics, including the importance and quality of aptitude tests; salaries of engineers and scientists; woman's part in engineering work; business executives and research; and an over-all organization of scientists and engineers. The final set of six essays is concerned with the development of creative thought and better expression on the part of engineers in their writings, reports, papers, etc.

HEATING AND VENTILATING FOR ARCHITECTS AND BUILDERS. By R. K. Cornell. Paul Elek Publishers Ltd., London E.C.1, 37-38 Hatton Garden, 1946. 56 pp., illus., diagrs., charts, tables, $10 \times 7^1/_4$ in., cloth, 7s.6d. The first two chapters of this practical book present the fundamental principles and the calculation of heat losses and heat requirements. Chapter III contains the classification and comparison of heating and water supply systems, the application of such apparatus, and water treatment. In Chapter IV will be found furnace control, the combustion of fuel, and running costs of systems. The final chapter deals with the types and operation of equipment for ventilating and air conditioning.

LEGAL PHASES OF CONSTRUCTION CONTRACTS. By I. V. Werbin. McGraw-Hill Book Co., New York and London, 1946. 267 pp., $8^1/_2 \times 5^1/_4$ in., cloth, $2.75. The author discusses forty-six different legal problems that have arisen in connection with construction contracts, of practical interest to engineers, architects, contractors, and attorneys. The book shows the court precedents that have been established on these problems and gives, in many cases, the actual language of the contract provisions and also the facts involved. The intent is to provide the layman without legal training or experience an understanding of the import of the courts' decision.

MATERIALS-HANDLING EQUIPMENT, a Modern Manual. By M. W. Potts. Pitman Publishing Corp., New York and Chicago, 1946. 172 pp., illus., $8^1/_4 \times 5^1/_2$ in., cloth, $2.50. This book is devoted to defining, describing, and presenting the application of a number of standard types of materials-handling equipment. Earth-moving and other equipment used primarily by contractors and specialized units for certain industries have been omitted. Types covered are dealt with under the following section headings: conveyors, elevators, hand-operated equipment, hoisting machinery, trackless carriers, tractors and trailers, and miscellaneous equipment with general applications.

PRINCIPLES OF FIELD AND MINING GEOLOGY. By J. D. Forrester. John Wiley & Sons, New York; Chapman & Hall, London, 1946. 647 pp., illus., diagrs., charts, maps, tables, $8^1/_4 \times 5^1/_2$ in., cloth, $7 This new text and reference work offers an analysis of geological field techniques that will serve as a guide for the approach to and solution of geologic problems. Meant for practical field use, the book is divided into four sections: the recognition of geologic phenomena; general field survey practices and procedures; special field techniques, including prospecting and development practices; and the interpretation and use of field data, including examples of reports. The book is extensively and effectively illustrated.

SOILS, CONCRETE AND BITUMINOUS MATERIALS, a record of a course dealing with Airfield Construction given at the Road Research Laboratory, Dept. of Scientific and Industrial Research, July-August, 1943. London, His Majesty's Stationery Office, 1946. 288 pp., illus., diagrs., charts, tables, $9^1/_2 \times 7^1/_4$ in., paper, 10s. net. (Obtainable from British Information Services, 30 Rockefeller Plaza, New York, $2.75.) In this volume are collected a series of lectures by some 35 specialists for the training of engineers in the construction of airfields from certain materials. Part I, on soils, covers geology and soil formations, the properties of soils, stabilization, construction methods, airfield design, and the theory of soil testing. Parts II and III deal with the properties, manufacture, and use of cement, concrete, and bituminous surfacings. Recommended testing procedures for various phases of the work with these materials are given in Part IV. A comprehensive and detailed index increases its use for reference purposes.

THEORY AND PRACTICE OF FILTRATION (Modern Library of Chemical Engineering). By G. D. Dickey and C. L. Bryden. Reinhold Publishing Corp., New York, 1946. 346 pp., illus., diagrs., charts, tables, $9^1/_4 \times 6$ in., cloth, $6. The general concept of filtration as considered in this book is limited to the separation of solids from liquids and gases by the use of porous media, with by far the most space devoted to liquid filtration. History, theory, and filtration principles are first discussed, followed by description of the types and uses of filters and their auxiliary apparatus. Three special applications are dealt with separately: oil filters, extractors, and expellers; water filtration; sewage clarification and sludge dewatering. Surface and interfacial separation of immiscible fluids are discussed in an appendix.

TRAINS, TRACKS AND TRAVEL, 7 ed. By T. W. Van Metre. Simmons-Boardman Publishing Corp., New York, 1946. 423 pp., illus., diagrs., $9^1/_4 \times 6$ in., cloth, $3.50. This popular treatise, now in its seventh edition and twentieth year, has again been revised to keep abreast of the continuing developments in the railroad field. Intended originally for boys, the book has become broad enough in scope and thorough enough in treatment to be of general interest to all amateurs of railroading. Extensively illustrated, the pictures and text cover the historical, mechanical, and operational phases of one of our greatest industries.

WATER BACTERIOLOGY, with special reference to Sanitary Water Analysis, 6 ed. By S. C. Prescott, C. E. A. Winslow, and M. H. McCrady. John Wiley & Sons, New York; Chapman & Hall, London, 1946. 368 pp., charts, tables, $8^1/_2 \times 5^1/_2$ in., cloth, $4.50. Intended both as a textbook for the student and as a reference manual for the laboratory worker, this book covers the public health phases of the subject. It discusses the distribution, behavior, and sanitary significance of bacteria introduced into water from extraneous sources, and describes the development of methods currently employed in sanitary water bacteriology, with official standards, paying special attention to the details of recognized tests and reactions. Separate chapters are devoted to sewage bacteriology and shellfish examination.

WATER TREATMENT AND PURIFICATION, 2 ed. By W. J. Ryan. McGraw-Hill Book Co., New York and London, 1946. 270 pp., illus., diagrs., charts, maps, tables, $8^1/_4 \times 5^1/_2$ in., cloth, $2.75. The purpose of this book is to make available to students, engineers, and plant managers a description, under one cover, of the several purification and other processes that are applied to water. The construction and operation of the different types of filtering, softening, and treating apparatus are described and illustrated by diagrams and photographs. The chemical reactions occurring in the treatments are also given. In this new edition have been added recent developments, such as organic ion exchange materials for water softening, new embrittlement prevention processes, etc.

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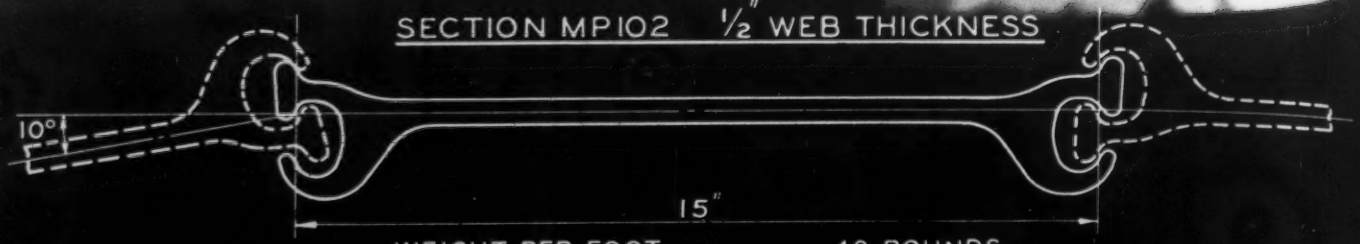

WEIGHT PER FOOT 40 POUNDS
WEIGHT PER SQUARE FOOT 32 POUNDS

SEE NOTE BELOW FOR DATA ON INTERLOCK STRENGTH.

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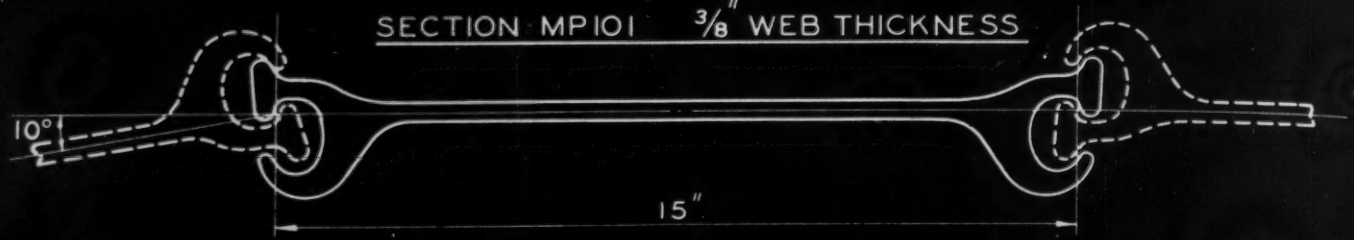

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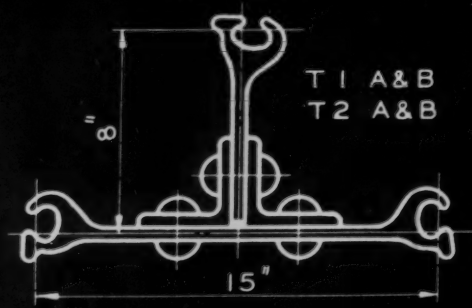

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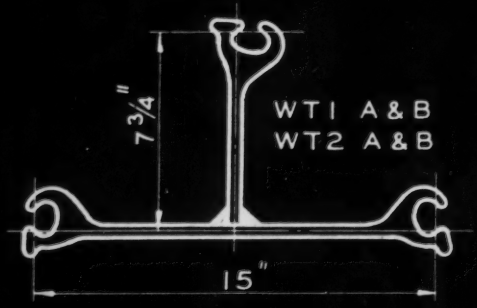

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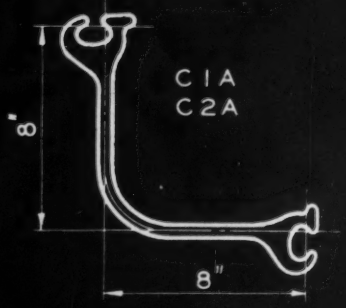

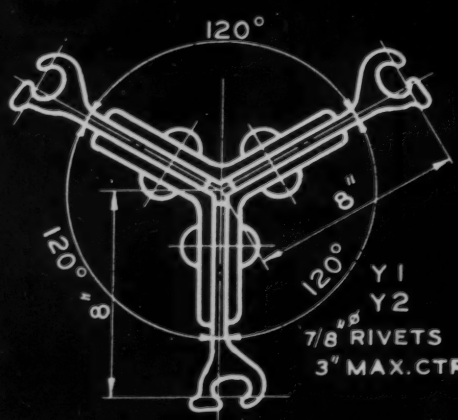

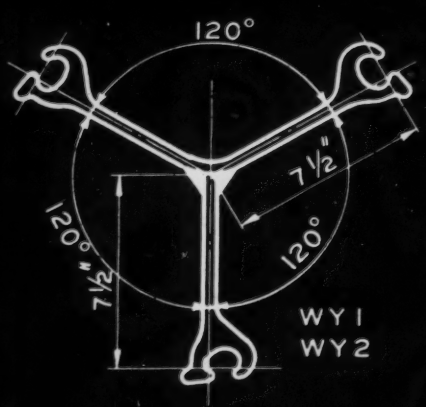

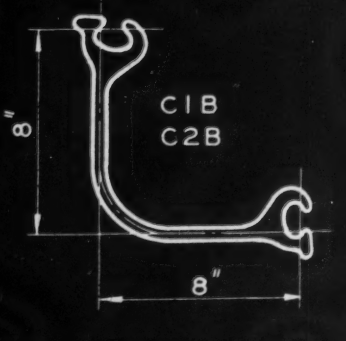

CONNECTIONS USING CODE MARK "1" ARE MADE FROM MP101, CODE MARK "2" MADE FROM MP102

WEIGHTS IN POUNDS PER LINEAR FOOT INCLUDING ANGLES & 7/8"ø RIVETS

CODE MARK	T1A	T2A	T1B	T2B	WT1A	WT2A	WT1B	WT2B	*Y1	*Y2	WY1	WY2	C1A	C2A	C1B	C2B
WEIGHT	75	82	75	82	53	61	53	61	95	114	53	61	35	40	35	40

*Y1 - 5"×5"×⅜" ANGLES MAXIMUM RECOMMENDED WORKING STRESS 6,000 POUNDS PER LINEAR INCH. — Y2 - 5"×5"×½" ANGLES MAXIMUM RECOMMENDED WORKING STRESS 8,000 POUNDS PER LINEAR INCH.

NOTE:- RECOMMENDED MAXIMUM WORKING STRESS FOR INTERLOCK TENSION 8,000 POUNDS PER LINEAR INCH, BASED ON AN AVERAGE ULTIMATE STRENGTH OF 16,000 POUNDS.

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CIVIL ENGINEERING; M. ASCE; over 20 years of wide and varied experience in practically every kind of engineering design and construction. Available for part-time work on estimating and preparing specifications for municipal, state, and federal public works. Location, New York City. C-301.

CIVIL ENGINEER; Assoc. M. ASCE; 38; civil and structural graduate; registered professional engineer; 16 years' experience, principally in construction. Experience covers wide field of heavy construction, including mass excavation and demolition; highway location and construction; industrial plant construction; dams, tunnels, harbor and waterways construction; 3 years as Naval officer, Civil Engineer Corps. C-302.

GRADUATE CIVIL AND TRAFFIC ENGINEER; Assoc. M. ASCE; age 35; University of Michigan and Harvard Bureau of Street Traffic Research. Lt. Col., Field Artillery; service in F. A. Observation Bn. and Army Transportation Section; 3 years as city traffic engineer; insurance and road construction experience. Desire administrative or engineering position in Northeast. C-303.

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CIVIL ENGINEER; Jun. ASCE; age 22; married; B.S.C.E., Cornell University, 1945; specialization in sanitary engineering; 6 months' experience in Navy Civil Engineer Corps as ensign. Desire position with sanitary engineering firm near New York City. Available immediately. C-305.

PLANT ENGINEER; Assoc. M. ASCE; civil graduate; age 45; wide experience in design, supervision, and construction of industrial buildings in all phases—architectural, structural, mechanical, electrical, water supply, fire protection, etc. First-class liaison man between top management and local managers. Available immediately. Location, anywhere for permanent position with growing concern. C-306.

CIVIL ENGINEER; Jun. ASCE; age 21; single; B.S. in C.E., Univ. of Illinois, with honors. Discharged from U.S.N.R. as ensign in July. Desire position with engineering firm in Detroit area. C-307.

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ASSISTANT OR ASSOCIATE PROFESSOR OF CIVIL ENGINEERING. Salary, $2,700–$3,400 for 9 months. Location, North Dakota. W-7118 (*c*)-D2932.

SENIOR ENGINEERS; civil, electrical, mechanical, and structural; Senior Draftsmen, civil, electrical, mechanical, structural, and architectural; civil, electrical, mechanical, and structural draftsmen; Senior Engineers; Chief Engineers and Chief Specification Engineer for foreign work, under 51, physical examination required. Salaries, $5,616–$9,152 a year for 54-hour week, plus traveling expenses on one-year contract. Write, giving record of education and experience with previous salaries received, also telephone number. W-7517.

RESEARCH ENGINEER. (*a*) Research Engineer trained in the mechanical-engineering phases of hydraulics and fluid mechanics, such as pumps blowers, heat transfer, instrument design, and power transmission. Some teaching of mechanics and hydraulics. (*b*) Research Assistants and Research Associates. Two men pursuing studies toward master's or doctor's degrees desired, for research projects, together with a limited amount of teaching. Experience in a laboratory desired. Salary, $2,100–$2,700. Write, enclosing photograph, scholastic and professional records, special qualifications and references. Location, Iowa. W-7518C.

ESTIMATOR, preferably not over 35, with about 5 years' experience in taking off quantities. Any general knowledge of pricing would be helpful. Salary open. Location, Connecticut. W-7552.

ASSISTANT ENGINEER, not over 35, civil graduate, for office and field work in consulting engineer's office. Should be able to take charge of plan preparation with a minimun of supervision. Experience in the following desirable: water distribution, sewage systems, paving, and airports. Good opportunity for man who can show results. Salary commensurate with ability. Location, Virginia. W-7558.

ENGINEER. (*a*) Hydrologist with 2 or 3 years' experience. Salary, $6,000 a year. (*b*) Chief Field Engineer experienced in irrigation work. Must be able to speak Spanish. Salary, $7,500 a year. (*c*) Chief Draftsman with experience in taking charge of drafting work in a civil engineer's office. Salary, $7,500 a year. Location, Colombia. W-7568.

CIVIL ENGINEER as office engineer-designer in large firm of consulting engineers. Salary, $3,600–$4,800 a year. Location, Alabama. W-7573.

ASSISTANT CONSTRUCTION SUPERINTENDENT, young, on building work. Should have had experience on monumental type of buildings. Must be qualified to supervise mechanical equipment as well as rough and finishing trades. Salary open. Location, New York, N.Y. W-7575.

JUNIOR CIVIL ENGINEERS AND INSTRUMENTMEN for topographical surveys and general construction. Must be single. Write stating education and experience. Location, American tropics. W-7583.

SENIOR STRUCTURAL ENGINEER, civil graduate, with experience as assistant on heavy structural steel design. Salary, $6,000–$7,200 a year. Location, Maryland. W-7591(*a*).

CONSTRUCTION REPRESENTATIVE AND MANAGER capable of handling and representing a large construction company. Must have had at least 5 years' experience in foreign construction and should have a knowledge of Portuguese or Spanish. Salary, $10,000–$12,00 a year, plus expenses. Location, South America. W-7603.

ENGINEERS. (*a*) Field Engineer, civil, for public relations work and sales promotion. Must have had 3 years' experience in structural design. Salary, $3,600–$4,200 a year. (*b*) Assistant Office Engineer with 2 years' experience in concrete technique, for office correspondence. Work will eventually lead to field position. Salary, $3,000–$3,300 a year. Location, New York, N.Y. W-7614.

ENGINEERS. (*b*) Construction Superintendent for installation of can manufacturing machinery, pumps, filling equipment, generators, engines, etc.; also construction work on erection of steel buildings, pipe lines, roads, etc. Location, Philippines. (*d*) Civil Engineer with about 10 years' experience on concrete construction, electrical piping, and ventilation. Able to give detailed instructions to contractors and check construction. Location, New Jersey. W-7616.

CHIEF DRAFTSMAN experienced in architectural and industrial engineering, such as layouts, heating, plumbing, industrial piping, ventilation, refrigeration, electric light and power wiring, sprinkler systems, etc., and some knowledge of architecture and structures. Location, Long Island, N.Y. W-7654.

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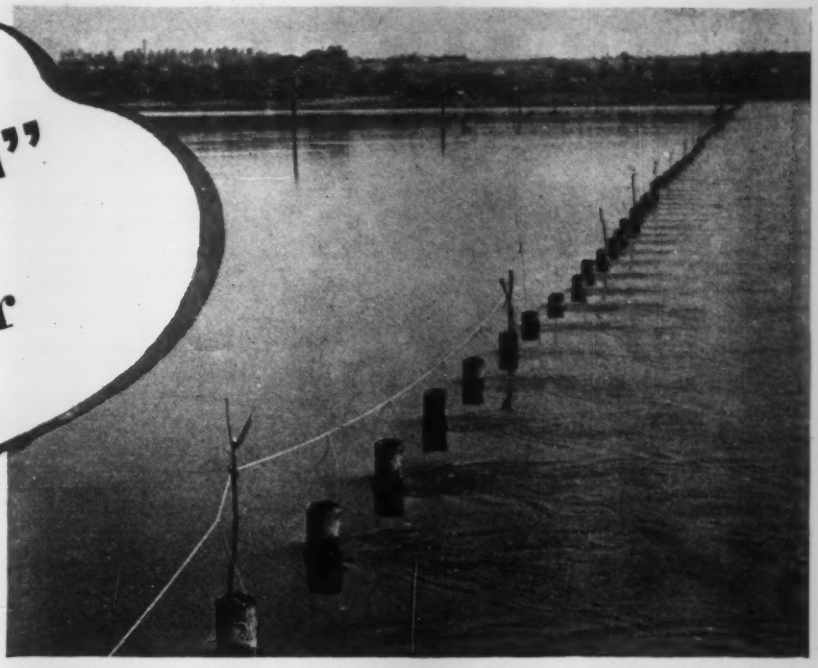

PARTIAL LINE-UP of 600 cased drill holes for blasting 8-inch pipe line ditch in Susquehanna River bed. Average depth of crossing was 4 feet; holes were 5 feet apart, sunk to depth of 8 feet below river bottom.

LOWERING A 5½" x 24" can of "Nitramon" A with hook and line into drill hole. Workman on left is stemming a charge with ⅜ inch diameter bluestone. Loading progressed safely and efficiently in quick time.

"NITRAMON" PRIMER, with Primacord attached through fluted metal tube at side of can, is ready for lowering in hole. Total charge in each hole averaged two cans of "Nitramon" A plus one "Nitramon" Primer.

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> *"'Nitramon' is the best handling material I've ever used for blasting," stated the job site superintendent. "The cans are sturdy and convenient to work with, and its safety and non-headache-producing qualities speed and simplify loading."*

A 25-hole test shot, supervised by a Du Pont Technical Representative, proved highly successful and established the loading pattern illustrated in the photos.

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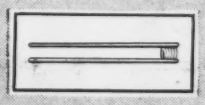

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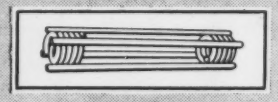

T4—TYSCRU 4 STRUT

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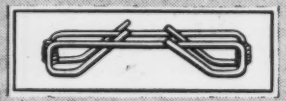

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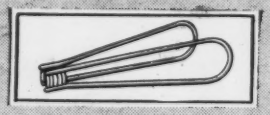

TL4F—TYLOOP FLARED 4 STRUT

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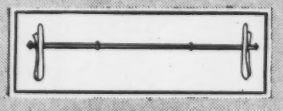

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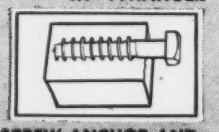

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Abstracts of articles on civil engineering subjects from publications (except those of the American Society of Civil Engineers) in this country and foreign lands. The articles indexed are on file in the Engineering Societies Library, 29 West 39th Street, New York, N.Y. Photoprints will be supplied by this Library at the cost of reproduction, 25 cents per page to members of the Founder Societies (50 cents to all others), plus postage, or technical translations of the complete text may be obtained at cost.

CONCRETE

SHRINKAGE. Shrinkage Stresses in Concrete. G. Pickett. *Am. Concrete Inst.—J.*, vol. 17, nos. 3 and 4, Jan. 1946, pp. 165–204, and Feb., pp. 361–398. Formulas derived from theoretical equations for flow of heat for shortening, warping, and stresses. Three cases taken into consideration: (1) slab or beam drying from one face only, (2) slab or beam drying from two opposite faces, and (3) prism drying from four faces. Theoretical shrinkages, stresses, etc., can be read from tables and charts given; comparison of theory with experimental results. Bibliography.

SLABS. Proyecto para una losa nervurada de 14 m. de claro, de hormigon armado, para puente carretero, P. Quilez Araque and V. Guerrero y Gama. *Revista Mexicana de Ingenieria y Arquitectura*, vol. 23, nos. 10, 11, and 12, Oct., Nov., and Dec. 1945, pp. 244–265. Project for ribbed slab of 14-m span, of reinforced concrete for highway bridge; design calculations.

WALLS. Develop Quake-Proof Design Data in Pacific Coast Concrete Masonry Tests. *Pit & Quarry*, vol. 38, no. 10, Apr. 1946, pp. 120–122 and 130. Illustrated report on tests to develop basic design data for hollow concrete masonry; tests covered wall panels in flexure and shear, and core beams in flexure; results of tests led to recommendation of improved structures of reinforced concrete masonry, particularly in areas subject to earthquakes, tornadoes, or hurricanes.

PORTS AND MARITIME STRUCTURES

COPENHAGEN, DENMARK. Warehouses and Transit Sheds at Ports, H. Fugl-Meyer. *Dock & Harbour Authority*, vol. 25, nos. 304 and 305, Feb. 1946, pp. 238–242 and Mar., pp. 270–271. Special reference made to experience gained during 50 years in Port of Copenhagen; origin of Free Port of Copenhagen; development of shed and warehouse types; illustrations and diagrams given.

DOCKS, FLOATING. Shell's Floating Docks Stand Firm Against Mighty Mississippi River. G. B. Nicholson. *Oil Weekly*, vol. 121, no. 7, Apr. 15, 1946, pp. 50–51 and 54. Illustrated description of floating docks for use at oil terminals to minimize flood damage and insure uninterrupted movement of oil from field to refinery; contributing to successful operation of docks are provisions to facilitate lateral movement in direction perpendicular to river banks; location of docks is changed frequently to provide water sufficiently deep to meet minimum depth requirements for barges being serviced.

DRYDOCKS, FLOATING. Floating Drydocks for United States Navy. *Engineering*, vol. 161, nos. 4179, 4181, 4182, and 4184, Feb. 15, 1946, pp. 145–147, (illustrations, 156; Mar. 1, pp. 193–195; Mar. 8, pp. 217–219, and Mar. 22, pp. 265–267. Illustrated description of different types; drydock building scheme was in hands of Bureau of Yards and Docks; whole purpose of drydock program was to enable Naval operations to be carried on many thousands of miles from American coast; question of transport of docks to site was major consideration.

DRYDOCKS, SOUTH AFRICA. Sturrock Graving Dock, Cape Town, D. E. Paterson. *Engineer*, vol. 181, nos. 4700 and 4701, Feb. 8, 1946, pp. 122–124, Feb. 15, 1946, pp. 144–145. Illustrated description of design and construction of dock capable of being used not only for repair facilities, but also for discharge of bulk cargo; details of dewatering method, concreting, method of handling concrete; dock-pumping machinery and control; steel caisson.

MILITARY ENGINEERING. British War Devices in 1945. *Engineer*, vol. 181, nos. 4695 and 4696, Jan. 4, 1946, pp. 31–33, Jan. 11, pp. 53–55, supp. plates. Review sets forth most striking points,

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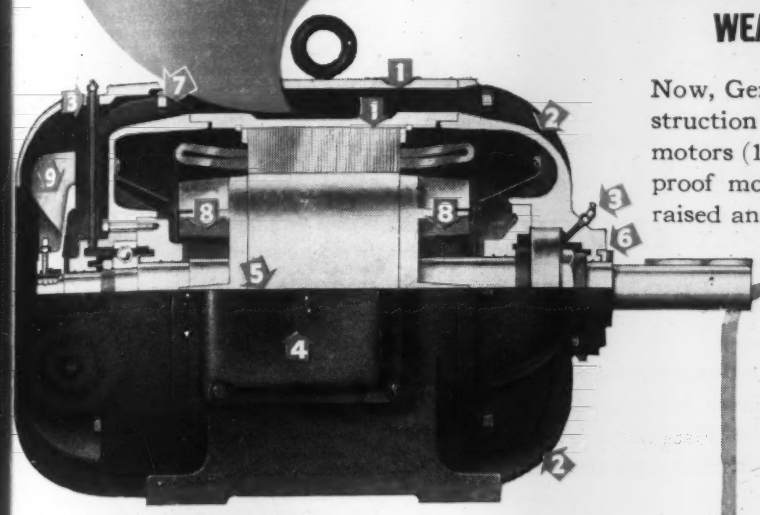

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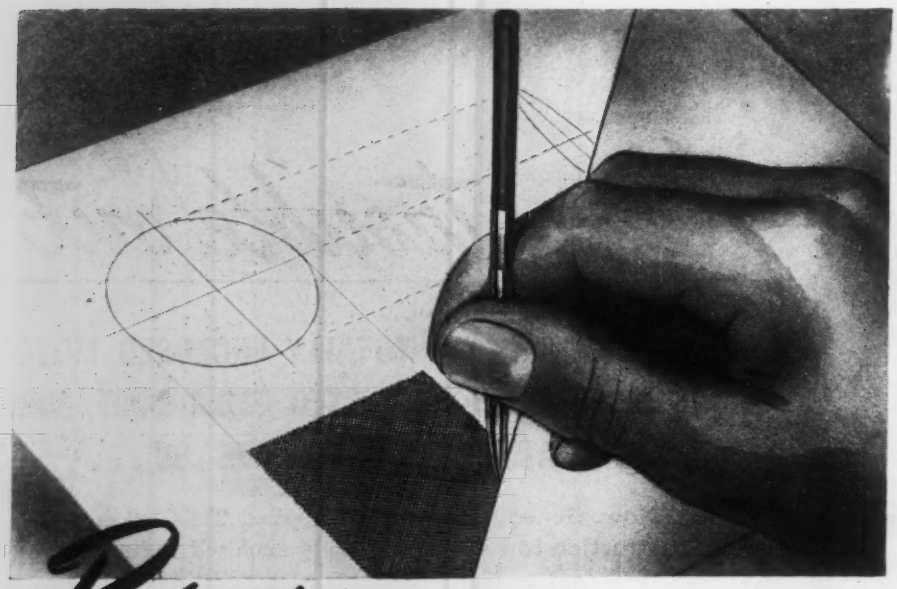

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referring, where possible, to articles wherein full description appears; Britain's oil pipe lines; "Operation Pluto" and "Operation Fido"; "Swiss Koll" floating pier and "Lily" floating landing ship; radar; "Shark" code name given to equipment for rapid rehabilitation of ports; bridge laying tanks; cross-channel transportation of rolling stock; plastic armor; flame-throwing; atom research.

PIERS, CONCRETE. Piers and Jetties of Precast Concrete, S. P. Lathrop. *Rock Products*, vol. 49, no. 2, Feb. 1946, pp. 136–137. Description of permeable jetties to prevent shore erosion, installed at Cliff Drive, Cleveland, Ohio, consisting of reinforced concrete members up to two tons weight, pre-cast piling, and deck slabs; notes on construction methods, and details of pre-cast units.

RECONSTRUCTION. I Lavori di ricostruzione delle opere del porto di Civitavecchia danneggiate dalle offese belliche, L. Greco. *Giornale del Genio Civile*, vol. 38, no. 2, Mar.-Apr., 1945, pp. 127–155, 4 supp. plates. Reconstruction of harbor of Civitavecchia, Italy, damaged during war; data on hydrographic and traffic conditions; illustrated description of prewar harbor facilities and of reconstruction work on piers, quays, docks, and breakwaters; data on costs included.

RECONSTRUCTION. La destruction et la remise en service des installations du port de Cherbourg, A. P. Pages. *Génie Civil*, vol. 123, no. 3174, Feb. 1, 1946, pp. 38–39. Illustrated description of destruction and reconstruction of port of Cherbourg, France; despite thorough destruction, main repairs were finished within about four months.

ROADS AND STREETS

HIGHWAY SYSTEMS, BRAZIL. Road to Open Brazil's Back Door, M. G. Mayer. *Better Roads*, vol. 16, no. 5, May 1946, pp. 17–18, and 24. Illustrated description of highway project to connect east coast of Brazil with its Bolivian border, which will open vast hinterland to settlers and mining and lumbering industry.

HIGHWAY SYSTEMS, CALIFORNIA. Sand Dune Road 20 Years Old, E. Q. Sullivan. *Western Construction News*, vol. 21, no. 4, Apr. 1946, pp. 92–94. Illustrated report on conditions that led to permanent solution of highway 80 in California desert west of Yuma, Ariz.; old highway was corrugated plank road that could be raised or lowered to conform with moving sand dunes; new highway of asphaltic concrete was built to meet increasing traffic; its location and level was determined to be safe from engulfment; results are reported beyond expectation, and maintenance cost decreased considerably.

HIGHWAY SYSTEMS, MEXICO. Mexico's Highways, H. J. McKeever. *Roads & Streets*, vol. 89, no. 3, Mar. 1946, pp. 78–83. Illustrated report on Mexico's highways, including gradient, width, curvature standards, hand labor vs. modern machines, penetration macadam, maintenance practices, culverts, typical contract details, and organization.

HIGHWAY SYSTEMS, PERU. Peru Is Building Modern Highways. *Better Roads*, vol. 16, no. 4, Apr. 1946, pp. 23–24. Illustrated report on Pan-American highway systems, including sources and amounts of funds used for road construction, improvement, and maintenance.

HIGHWAY SYSTEMS, RELOCATION. Oregon Highway Modernized, K. D. Lytle. *Western Construction News*, vol. 21, no. 3, Mar. 1946, pp. 89–92. Illustrated description of relocation of Southern Oregon highway; project is characterized by heavy excavation and improved procedure of embankment stabilization; map is included.

INTERSECTION. Two-Bridge Rotary Built for Controlled Access Interchange, D. W. Loutenheiser. *Roads & Streets*, vol. 89, no. 4, Apr. 1946, pp. 85–88. Design details of unusual type of interchange on Shirley Memorial Highway in Arlington, Va.; illustrations of general layout; bridges are designed as two-span rigid frames with plain concrete faces and stone-faced wing walls.

LANDSLIDES. Slide Control, E. L. Worthington. *Roads & Streets*, vol. 89, no. 5, May 1946, pp. 90–92 and 98. Practical suggestions for correcting conditions which cause slides, or for stopping or retarding slides in West Virginia; discussion of various types of slides and their causes; explanatory illustrations included.

MAINTENANCE AND REPAIR. How Roads at Idaho Naval Base Were Rebuilt on Soil-Cement Base, G. K. Brodie. *Pac. Bldr. & Engr.*, vol. 52, no. 5, May 1946, pp. 46–50. Illustrated description of repairs to roads of Farragut (Idaho) Naval Base, including base design, scarifying method, spreading of bulk cement, compaction, treatment with oil; data on laboratory equipment and tests included.

MICHIGAN. Thin Paving Goes Farther, F. W. Liddle. *Am. City*, vol. 61, no. 2, Feb. 1946, pp. 83–85. How careful design of rigid pavement of Wyandotte, Mich., streets has enabled use of 5-in. slab instead of usual thicker construction, resulting in economy and desirable load-carrying qualities; use of integral curb and gutter.

ROAD MACHINERY. Special Equipment Places 3-Ft. Widening Strips Along Sides of Concrete Pavement. *Construction Methods*, vol. 28, no. 5, May 1946, pp. 94–96. Concrete roads in Texas

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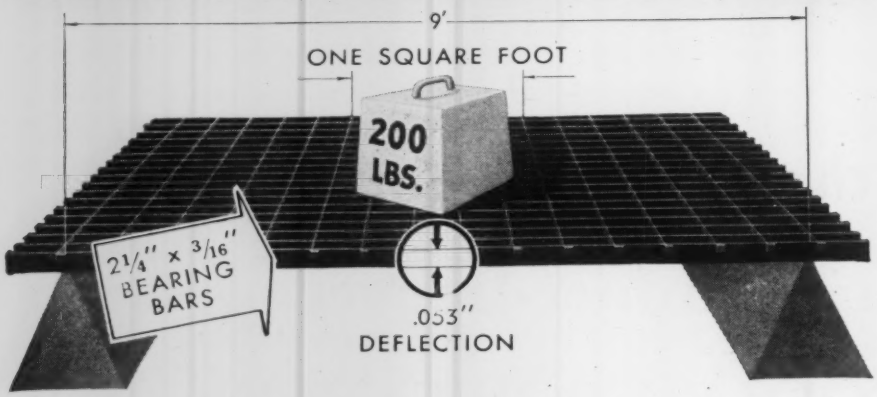

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ROAD MACHINERY. Tractor-Scraper. *Construction Methods*, vol. 28, no. 3, Mar. 1946, pp. 96–97, 148, and 150. Illustrated description of use of tractor-scraper units in highway and drainage ditch construction work on U.S. 75 and Minnesota State Trunk Highway 55 near Wheaton, Minn.; equipment averaged 70,000 cu yd per week in moving earth from adjacent drainage ditches into roadway embankments.

ROAD MATERIALS, TAR. Use of Tar in Road Construction and Maintenance. G. H. Fuidge. *Surveyor*, vol. 105, no. 2827, Mar. 29, 1946, pp. 247–251. Properties of road tar; practical aspects of road making with tar, such as tarmacadam, base courses, and single courses, wearing courses and carpets, gravel macadam, dense tar surfacing; control of road-making processes using tar. Bibliography.

SAND-ASPHALT. Charleston Tries Sand-Asphalt Streets. *Am. City*, vol. 61, no. 5, May 1946, pp. 113–115. Illustrated description of "low cost" street paving with sand-asphalt at Charleston, S.C.; data on electric mixing plant and construction procedure included.

SNOW AND ICE CONTROL. Snow Traps Cut Out Plowing Costs, H. R. Smith. *Roads & Streets*, vol. 80, no. 3, Mar. 1946, pp. 87–89. In Antrim County, Michigan, with one of heaviest snowfalls of any county in United States, snow traps are plowed in fields along roads instead of raising snow fences; illustrated description of procedure and data on costs.

SNOW AND ICE CONTROL. What Causes Spring Break-Up? A. M. Williams. *Highway Mag.*, vol. 37, Mar. 1946, pp. 63–65. Observations in central Michigan over period of years suggest explanation of spring break-up; latter's severity depends on time of first "deep freeze" and amount of liquid precipitation thereafter; sketches contribute toward explanation of phenomenon and toward means of prevention.

SOILS, EROSION. Growing Grass Through Asphalt, F. R. Bruto. *Highway Mag.*, vol. 37, Apr. 1946, pp. 87–89. Illustrated description of applying "soil paint" to bare surfaces for prevention of soil erosion where other methods fail; experiments in using asphalt mulch on seeding operations proved good erosion control even after grass was established.

SOILS, STABILIZATION. Grounds Maintenance and Vegetation for Airports Highways and Park Areas. *Public Works*, vol. 77, no. 4, Apr. 1946, pp. 23–24. Brief description of efficient maintenance of unpaved airport areas, roadsides, parks, athletic fields, playgrounds, and areas around public buildings; soil preparation, fertilization, seeding, irrigation, prevention of water erosion, proper mowing, etc., are recommended.

STREET LIGHTING. Planning Modern Street Lighting, S. R. Williams. *Am. City*, vol. 61, no. 5, May 1946, pp. 153 and 157. Discussion of planning modern street lighting, considering street surface brightness, glare, installation, mounting height, spacing, and forestation; conclusions drawn from general discussion are included.

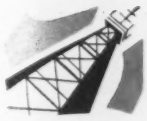
SUBSOILS. Soil Compaction in Embankments and Subgrades, E. F. Bennett. *Roads & Bridges*, vol. 84, no. 4, Apr. 1946, pp. 80–81, 144, 146, 148–159. Illustrated study of soil compaction in connection with highway construction, including compaction theory, Proctor test, construction procedures, layer construction, moisture control, specifications, embankment foundations, etc. Before Can. Good Roads Assn., Quebec.

SEWERAGE AND SEWAGE DISPOSAL

TREATMENT PLANTS, PILOT. Pilot Plant Shows Capacity Required of Chlorinators, C. G. Gillespie. *Sewage Works Eng. & Mun. Sanitation*, vol. 17, no. 4, Apr. 1946, pp. 200–203 and 226. Illustrated description of pilot plant in Los Angeles, Calif., built to determine size of installation to treat screened sewage; it consists of 4-in. trash pump, head-regulating tank, weir box, chlorinator, and four circular tanks; data on character of sewage before and during pilot-plant operation; description of operation; results are presented by charts.

WASTE UTILIZATION. Investigation of Plant-Growth Substances (Auxins) in Sewage Products, C. A. Chaplin and C. J. Regan. *Soc. Chem. Industry—J.* (Trans. & Communications), vol. 64, no. 12, Dec. 1945, pp. 331–332. In order to ascertain whether auxin content (if any) of sewage products is likely to play role in use of sewage wastes as fertilizers, a number of normal sewage products of London were examined for their auxin content; results show that most products contain auxins in small but measurable quantities; most of these plant-growth substances are decomposed during normal drying of sludges.

WASTE UTILIZATION. Processing Dried Sludge in Fertilizer Production, H. M. Snapp, Jr. *Sewage Works Eng. & Mun. Sanitation*, vol. 17, no. 5, May 1946, pp. 254–255 and 278. Illustrated description of handling sludge at Southwest Sewage



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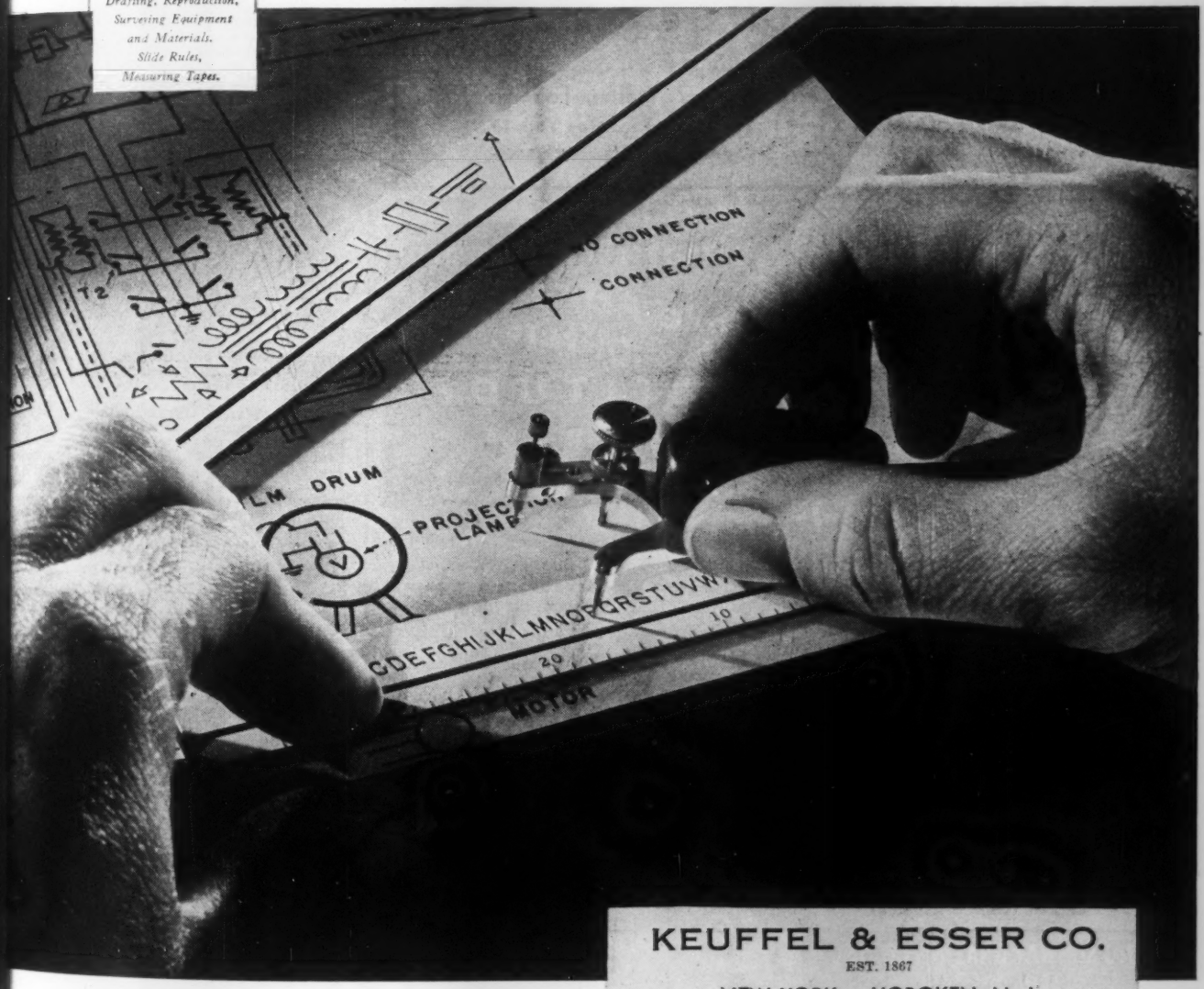

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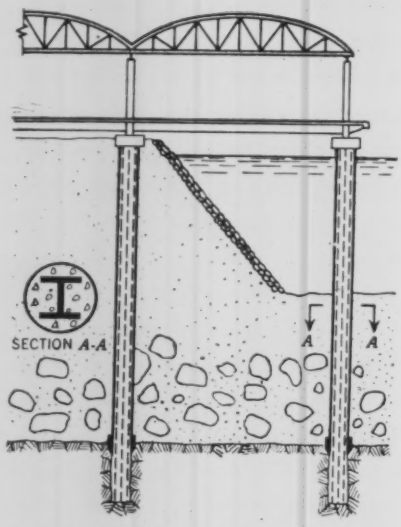

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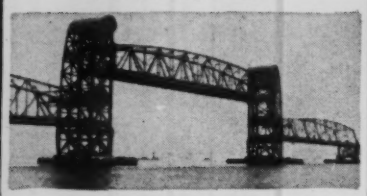

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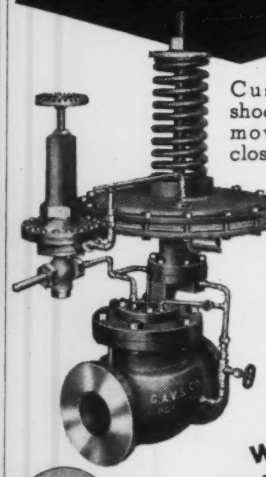

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STRUCTURAL ENGINEERING

BEAMS AND GIRDERS, STRESSES. Locating Points Along Beam Axis Corresponding to Known Moments, W. C. Goodwin. *Am. Concrete Inst.—J.*, vol. 17, no. 4, Feb. 1946, pp. 402–404. Description of method of locating points of inflection, points to bend or anchor reinforcement, corresponding to predetermined moment values; method is valid for any combination of uniform and concentrated loads; method is applicable to design of concrete building frames.

DESIGN. Basic Principles of Beam Design, G. Lowe. *Surveyor*, vol. 222, no. 2830, Apr. 19, 1946, pp. 309–311. Review of methods of solving basic problems connected with design of beams, such as shear, moment, slope, deflection, most unfavorable position of moving loads, etc.; some remarks on reinforced concrete beams are included. Before Inst. Mun. & County Engrs.

EARTHQUAKES, UNITED STATES. Damage to Buildings Proves Slight in Washington's Recent Earthquake, H. H. Edwards. *Pac. Bldr. & Engr.*, vol. 52, no. 3, Mar. 1946, pp. 44–45. Report on effect of earthquake in Washington on Feb. 14, 1946; damages were slight, and confined to buildings situated on soft earth; solid foundation is no guarantee against damage, warns authority; design, bracing, and shape of structure are important factors in stability; illustrations.

WATER RESOURCES

ROANOKE, VA. Carvin's Cove Water Supply Project for Roanoke, Va., L. R. Howson. *Am. Water Works Assn.—J.*, vol. 38, no. 4, Apr. 1946, pp. 480–490. Illustrated report on old and recent water supply of Roanoke, Va.; main sources of old project were springs, Falling and Beaver Creeks, and wells; for additional supply other available sources were studied and construction and annual cost estimated; Carvin's Cove was best solution both as to quality of water and future enlargement; presentation of hydraulic data; notes on proposed filter plant, pipe line capacity, and storage reservoirs.

SOVIET UNION. Water Supply in Soviet Union, M. Porfiryev. *Water & Water Eng.*, vol. 47, no. 583, Dec. 1944, pp. 551–557. Position of water supply at present time; water works development during war; rehabilitation of water supply installations; problems and prospects for future.

WATER WELLS, ELIZABETH CITY, N.C. Shallow Wells Tap Dismal Swamp for City Water Supply. *Eng. News-Rec.*, vol. 133, no. 20, Nov. 16, 1944, pp. 644–646. Increased water supply of 400,000 gal per day was obtained at Elizabeth City, N.C., by constructing 109 gravel-backed shallow wells in Dismal Swamp, where water table varies from ground level to few inches below; to build well, casing about 30 ft long and 10 in. in diameter was jetted into place, and after it had been cleaned out pipe 2 in. in diameter ending in 5-ft screen was inserted and packed with gravel, after which the casing was removed.

WATER WELLS, ONTARIO. Drill Gravel Wells to Increase Woodstock Water Supply, J. R. Sullivan. *Eng. & Contract. Rec.*, vol. 59, no. 3, Mar. 1946, pp. 72–73. Illustrated report on measures to make larger supply of water available to city of Woodstock, Ont.; after drilling tests, permanent wells were installed and water was pumped into pipe lines leading to city pump station; wells had depth of from 56 ft to 98 ft and layer of water-bearing gravel was from 33 to 51 ft thick.

WATER TREATMENT

ALGAE CONTROL. Appleton, Wis., Gets Rid of Algae, W. U. Gallaher. *Am. City*, vol. 61, no. 5, May 1946, pp. 118–119 and 167. Activated carbon is applied in water treatment plant at Appleton, Wis., to meet problem of algae control; data on plant filters, odor control, and analysis before and after treatment are included; general view of filter plant, flow sheet, and cross-sectional view of chemical building are presented.

CALIFORNIA. California's Big Softening Plant Increases Its Output. *Water Works Eng.*, vol. 99, no. 9, May 1, 1946, pp. 473 and 522. Studies of electrolytic softening process indicate improved chemical quality over conventional methods; report on corrosion-inhibiting qualities of various agents, effects of softened water on plant growths, and on soil permeability; data on average analysis of Colorado River water in natural and in softened state included.

CHILTON, WIS. Ahead in Sanitation Parade. *Am. City*, vol. 61, no. 5, May 1946, pp. 123–124. Illustrated description of water-treatment plant and bioactivation sewage-treatment plant at Chilton, Wis., including zeolite-softening units, iron-removal units, trickling filters, and pumping equipment.

CHLORINATION. Milestones in Chlorination of Toronto Water Supply, N.J. Howard. *Eng. & Contract. Rec.*, vol. 59, no. 3, Mar. 1946, pp. 64, 66, and 68. Illustrated report on treatment of

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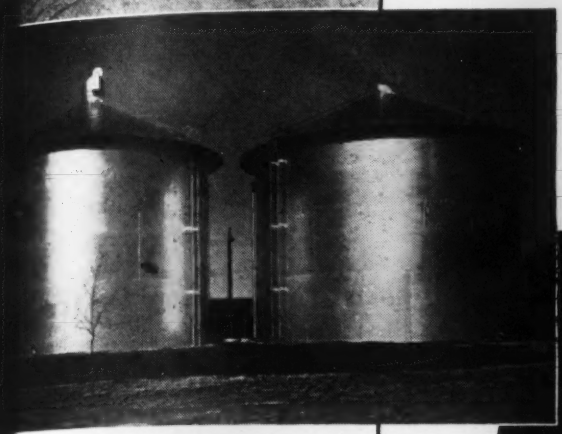

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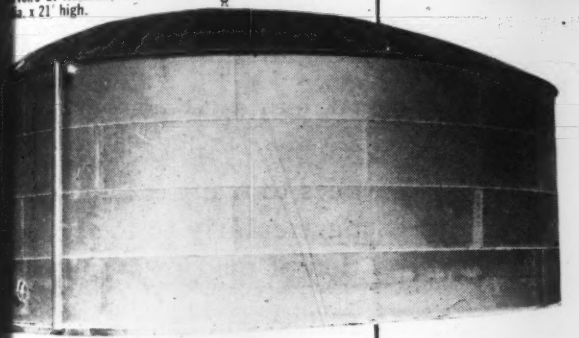

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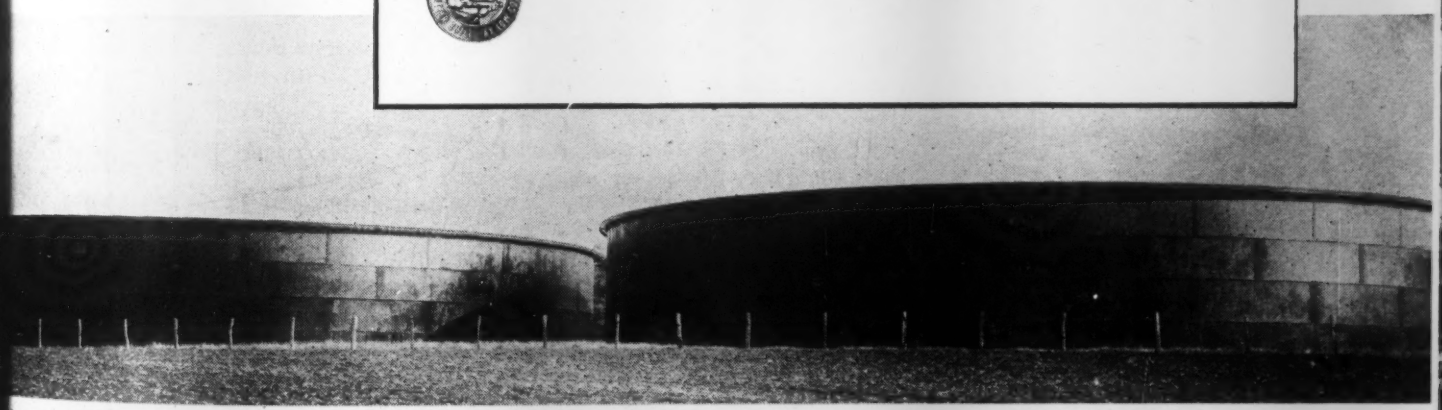
The permanence of steel, its strength, lower cost and ease of erection, apply to particular advantage in the reservoir storage of water. Pittsburgh-Des Moines Steel Reservoirs are impervious to the effects of climate, seasonal changes and weather—cannot crack, spall or deteriorate. With simple maintenance and periodic painting they are good for a lifetime—a truly sound investment! *Let us consult on your needs.*



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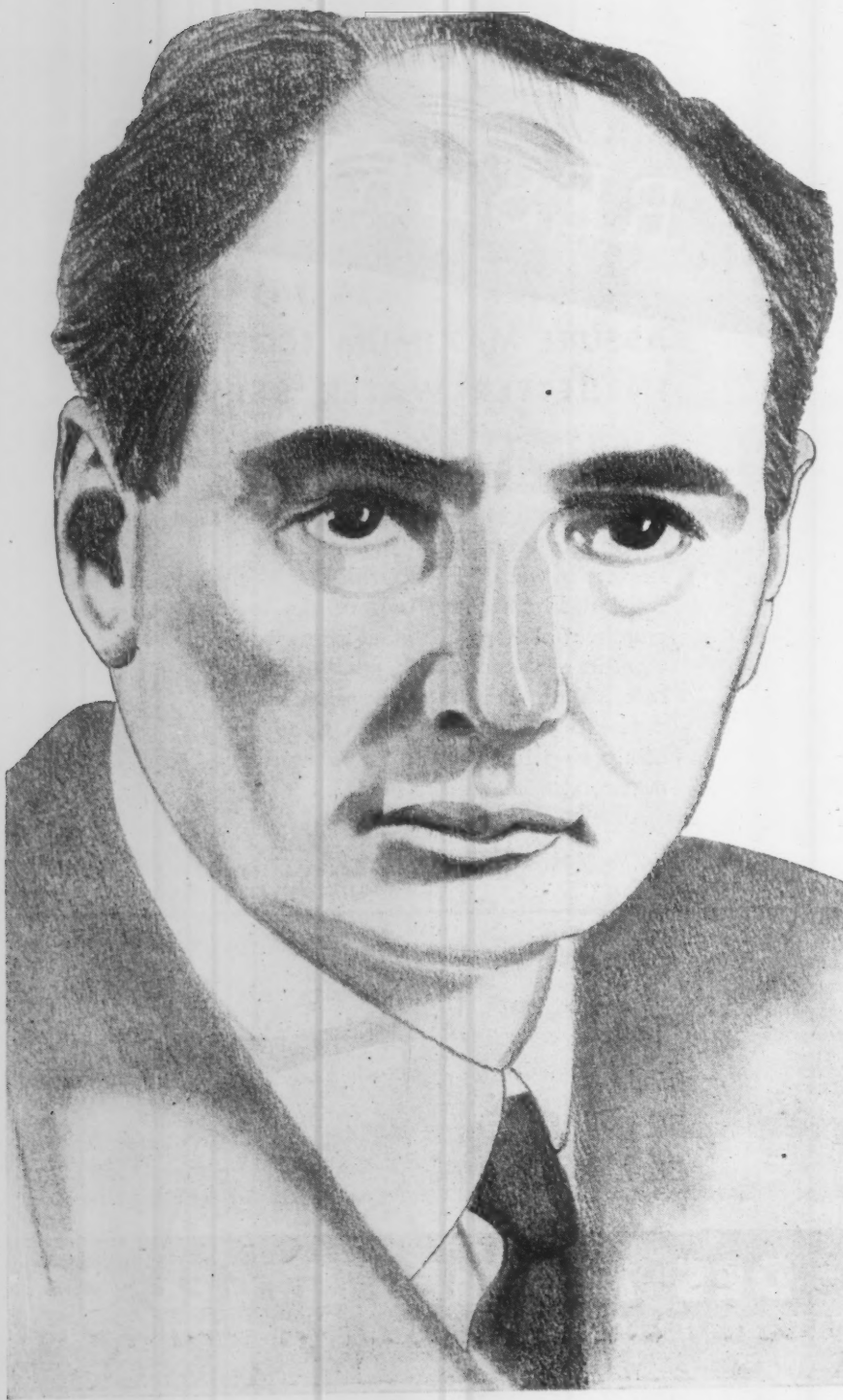
then he said to himself:

Either you eat . . . or you don't



The new Food Minister of Great Britain, Evelyn John St. Loe Strachey, highlighted a brilliant speech in the House of Commons with:

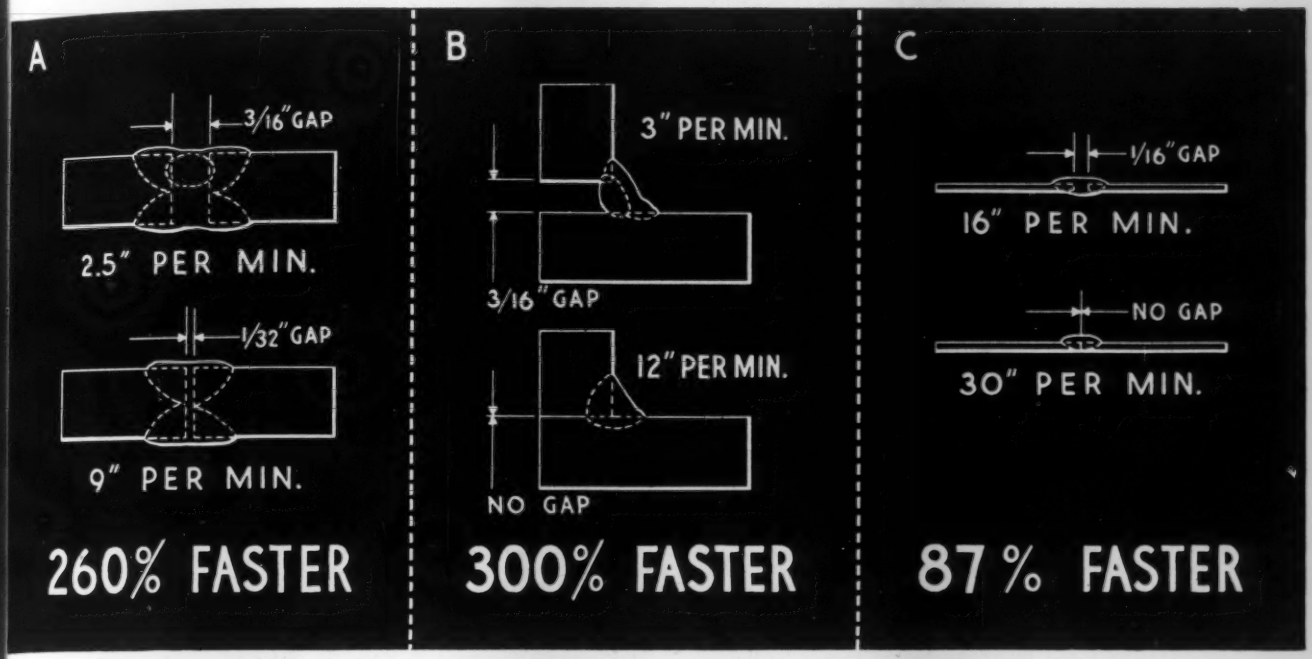
"Famine, like peace, is indivisible."

He was talking about famine but his phrase aptly applies to many conditions... particularly to the condition of modern production.

Either you compete . . . or you don't.

MR. STRACHEY: Here's food for thought to help you get the full measure of competitive advantage from arc welding:

GET GOOD FIT-UP



Care in cutting, forming and fitting up of plates and shapes to be welded pays big dividends. By improving fit-up of joints, you increase welding speed and thereby cut costs and minimize distortion.

EXAMPLE A—This square butt joint in 3/8″ plate with gap of 3/16″ is made at an arc speed of 2.5″ per min. With recommended gap of 1/32″, speed is 9″ per min.... 260% faster.

EXAMPLE B—This fillet weld in 1/2″ plate, with 3/16″ gap, is made at an arc speed of 3″ per min. With no gap, speed is 12″ per min.... 300% faster. Both welds have a 5/16″ throat.

EXAMPLE C—This butt joint in 14 ga. sheet, with 1/16″ gap, is made at an arc speed of 16″ per min. With no gap, speed is 30″ per min.... 87% faster.

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water supply at Toronto, where typhoid fever epidemic started in 1910 due to water pollution; discussion of measures to improve sanitary conditions; by means of chlorination and steady taste control, typhoid death rate dropped from 40.8 per 100,000 of population in 1910 to zero in 1944–1945.

COAGULATION. Coagulation with Ferric Salts. J. B. Nickel. *Water & Sewage Works*, vol. 93, no. 4, Apr. 1946, pp. 147–148. Discussion of ferrous sulfate as coagulant; inherent differences between coagulating with ferrous salt and ferric salt; notes on ferric chloride, solution pot equipment, floc formation characteristics of ferric sulfate coagulation, color removal and taste and odor control. Before Am. Water Works Assn.

FILTRATION PLANT, QUEBEC. City of Montreal Building Addition to Filtration Plant at Verdun. Eng. & Contract. Rev., vol. 59, no. 3, Mar. 1946. pp. 88–89. Illustrated description of plant increasing capacity from 150 to 200 mgd; illustrations present general view of construction work, installation of 24-in. reinforced concrete main, construction of gate house and winter protection of structure.

FILTRATION PLANTS, TORONTO, ONT. Experiences with Three Types of Filtration Plant, N.J. Howard. *Water Works Eng.*, vol. 99, no. 9, May 1, 1946, pp. 474–477, 522, and 524. Three different water-purification plants at Toronto are described; slow sand type built in 1912, drifting sand filters built in 1918, and rapid sand filters built in 1941; discussion of experiences with these different types, including practical comments.

HISTORY. Advances Since 1869 in Hydraulic and Sanitary Engineering, C. B. Burdick. *Western Soc. Engrs.—J.* (75th Anniv. Ed.), Dec. 1944, pp. 81–90. Review deals with use of water and disposal after use as sewage.

MATERIALS. Diatomaceous Earth Filters for Water Purification. *Pub. Works*, vol. 75, no. 12, Dec. 1944, pp. 21–22, 49. Successful use of diatomite filters in portable units for military field purification of water, suggests possibility of adaptation for public water supplies; advantages and disadvantages as compared with more common type filter are cited; notes on operation and construction.

MILITARY ENGINEERING. Okinawa—DDT and Water Treatment, A. E. Stilson. *Am. Water Works Assn.—J.*, vol. 38, no. 5, May 1946, pp. 625–636. Description of topographic and climatic conditions; insects, larvicides, and diseases and campaign to fight them; discussion of water treatment and equipment, DDT in action, and Japanese water system.

PRESENT STATUS. Present Status of Water Treatment, A. E. Berry. *Water & Sewage*, vol. 84 no. 3, Mar. 1946, pp. 17–20 and 60. Survey of trends in various phases of purification of municipal water supplies; examples of actual and of proposed plants are described and illustrated; discussion on chlorination, coagulation, filter media, filter underdrains, filter washing, water softening, and water treatment costs, etc.

SEA WATER, SALT REMOVAL. Preparation of Drinking Water from Seawater, H. Ingleson. *Soc. Chem. Industry—J.* (Trans. & Communications), vol. 64, no. 11, Nov. 1944, pp. 305–309. Investigation of chemical methods of treating seawater to produce drinking water, for use by air crews adrift in rubber dingeys on open sea; method finally developed consisted in treating sea water with briquets of reagent containing silver zeolite, barium hydroxide, octahydrate, silver oxide, fuller's earth, and graphite.

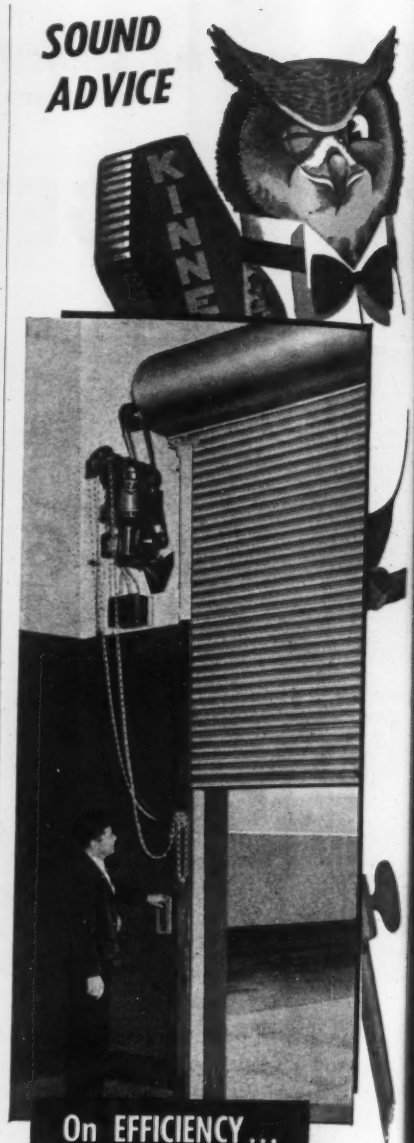
SOFTENING. Maintenance of Base Exchange Softeners, T. M. Johns. *Southern Power & Industry*, vol. 64, no. 2, Feb. 1946, pp. 85 and 90. Brief discussion of operation of base-exchange water softeners, with particular reference to equipment maintenance problems confronting operators; importance of killing and removing algae which cause pollution of zeolites; details of procedure found to be practical and effective in restoring capacity of algae-infected softener.

SOFTENING, THRESHOLD TREATMENT. Sodium Hexametaphosphate as Corrosion Inhibitor for Ottawa Tap Water, M. Cohen. *Electrochem. Soc.—Preprint No. 89—17*, for meeting Apr. 11–13, 1946, pp. 193–207. Report on study made by laboratory test methods; results obtained confirmed each other qualitatively, but there was best agreement between rocker-type apparatus and circulation; pitting effects obtained with sodium hexametaphosphate, which effects could be detected by voltage measurements; for best inhibition 50 to 60 ppm of sodium hexametaphosphate were required.

TREATMENT PLANTS, CHARLOTTE, N.C. Charlotte's Water Demand Stays Up. *Am. City*, vol. 61, no. 2, Feb. 1946, p. 71. Brief note on successful operation of Charlotte, N.C., water-treatment plant despite unanticipated load increase during war; plant capacity, cited as 16.5 mgd, requires enlargement to meet future demands.

WATER BACTERIOLOGY. Study of Merits of Various Confirmatory Media, P. J. Philson. *Water Works Eng.*, vol. 99, no. 8, Apr. 17, 1946, pp. 386–388. Illustrated report on results of some 1,800 tests made at Columbia (S.C.) water works

SOUND ADVICE



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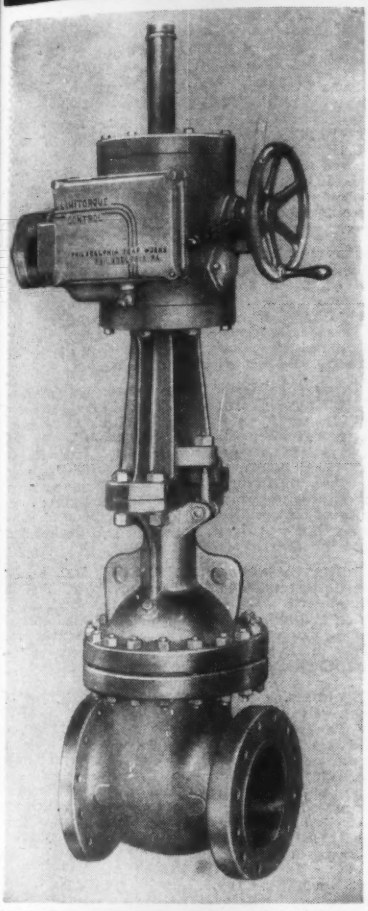

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The Type "SM" Limitorque Valve Operator (shown at left) is designed especially for valves working at low to medium temperatures, low to high pressures, and normal speed of operation.

This Unit is mounted on top of valve yoke . . . no extra gears, nuts or bearings required. Stem nut is inside and furnished with Limitorque Unit. Nut is directly inside worm gear which drives it. (All clutches and connecting sleeves are eliminated.)

The Limitorque is designed for plug, cock, gate and globe valves. . . . Entire Unit and nut can be lifted off valve yoke, by removing flange bolts, and without disturbing wiring.

A special high starting torque motor, reduction gears, limit switches are all in one weatherproof assembly — and all electrical connections are made to one terminal board, easily accessible by removal of watertight cover. . . . Heat treated helical gears and hardened ground and polished worm and bronze worm gear are used.

A handwheel is provided for manual operation and does not revolve during motor operation. During hand operation motor is mechanically disengaged. The Limitorque is always operative electrically. There is no danger to operator should he be turning handwheel when motor is started, since automatic clutch disengages handwheel instantly, without shock. Declutch lever changes from motor to hand operation. The usual Limitorque "hammerblow" device allows motor to reach full speed before load is engaged. This imparts the "hammerblow" necessary to unseat sticking valve.

Torque seating switch insures tight valve closure without strain on valve parts. Protection from damage due to a foreign object obstructing closing is provided, because motor is shut off by thrust exerted on valve disc. Valve is protected during entire closing operation.

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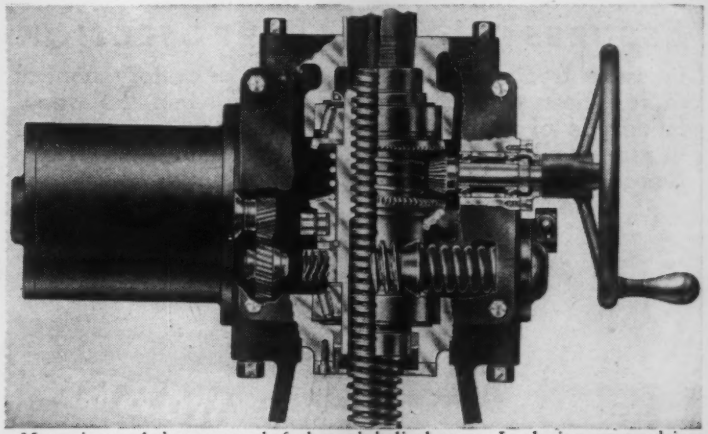
1. Micrometer torque seating switch.
2. Self contained unit — no gears, nut or bearings to buy.
3. Weatherproof, dust-tight and watertight construction.
4. Hammerblow device.
5. Non-rotating handwheel built into the unit.
6. Automatic declutching.
7. One terminal board for all electrical connections.
8. High torque motors.
9. Simple valve yoke.



Motor is coupled to worm shaft through helical gears. In closing, worm drives worm gear until lugs on the gear meet matching lugs on clutch. Torque is transmitted to the nut through splines connecting the clutch to stem nut. Torque spring is then compressed by axial movement of worm on worm shaft. When torque spring has been compressed to predetermined setting, torque switch is actuated by a tripping collar on worm shaft. This interrupts current to holding coil of controller and stops motor. Inertia of motor is absorbed in further compression of the torque spring. Opening travel is governed by geared limit switch.

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plant to indicate desirability of various confirmatory media; description of tests and results obtained.

WATER CHLORINATION. Temporary Hypo-Chlorinator for Five Dollars, J. R. Snell. *Water Works & Sewerage*, vol. 91, no. 11, Nov. 1944, pp. 404–405. Description of gravity hypo-chlorinator which can be used to feed either sodium or calcium hypochlorite at any rate between 10 and 100 gal per day.

WATER WORKS ENGINEERING

DES MOINES, IOWA. Des Moines Infiltration System Was Developed Methodically, C. B. Burdick. *Water Works Eng.*, vol. 99, no. 9, May 1, 1946, pp. 461–463, 534, and 536. Review of improvement of water works consisting of infiltration system based on thorough investigation of conditions of Racoon River valley; at present, 15 flooding basins are in service for tiding over periods of inferior river bed filtration capacity; river flow is augmented by storage in reservoir formed by each dam 70 ft high; charts show growth in pumpage.

FORT WORTH, TEX. Wartime Capital Improvement, W. S. Mahile and U. Stephens. *Am. Water Works Assn.—J.*, vol. 38, no. 4, Apr. 1946, pp. 491–498. Water supply conditions of Fort Worth, Tex., had to be improved to meet increased demands due to war impact; description of additional storage and supply mains and of reservoirs, one with walls of gravity type, other of reinforced concrete; results of improved pump operation are presented in tables.

HASTINGS, NEBR. Hastings' Water Utility Has Seen Sixty Years of Service, A. S. Reiff. *Am. City*, vol. 61, no. 5, May 1946, pp. 108–110. Data on water supply of Hastings, Nebr., are presented, including operating experiences during 60 years of service; water supply of airport required drilling of additional 20-in. well to depth of 150 ft; illustrated description of pump station.

INDIA. Proposed Extension of Water-Supply of Bombay, C. Inglis. *Instn. Engrs. India—J.*, vol. 26, no. 2, pt. 1, Dec. 1945, pp. 22–28, supp. plate. History of Bombay's water supply and description of general layout; reservoirs at Tulsi and Tansa; inadequacy of water supply led to plan to divert water from Vaitarna River through tunnel into Tansa Lake or to take water from tail waters of hydroelectric plant at Bhivpuri; both projects are discussed; hydrological data presented.

MAINTENANCE AND REPAIR. Well-Planned Headquarters Aids Maintenance Work, T. E. P. Woodward. *Water Works Eng.*, vol. 99, no. 7, Apr. 3, 1946, pp. 332–334. Illustrated description of new water maintenance building at Macon, Ga.; brief data on water supply system and on distribution maintenance work.

PHILIPPINE ISLANDS. Restoring Manila's Water System to Service, L. K. Clark. *Am. Water Works Assn.—J.*, vol. 38, no. 5, May 1946, pp. 608–624. Report on reconstruction of Manila's water supply including plans on general layout, pipelines, aqueducts, and filtration plant; discussion of chemical treatment, pre-liberation plans, Novaliches Dam supply, emergency sources of supply, repair of distribution system, treatment of resumed supply, and distribution system survey.

SALT LAKE CITY. New Water Supply Project Progresses for Salt Lake City, H. C. Godbe. *Western City*, vol. 22, no. 3, Mar. 1946, pp. 18–22. Before 1934, Utah Lake water was used for irrigation purposes while mountains furnished drinking water; drought conditions in 1934 called for new plan consisting of Deer Creek reservoir division and Utah Lake division; illustrated description of project.

ST. LOUIS, MO. Water System of St. Louis, T. J. Skinker. *Water Works Eng.*, vol. 99, no. 9, May 1, 1946, pp. 456–458. Illustrated description of principal features of present water works and review of changes made since first public supply was put into service in 1831.

ST. PAUL, MINN. St. Paul, Minnesota—Survival and Retirement Experience with Water Works Facilities. *Am. Water Works Assn.—J.*, vol. 38, no. 3, Mar. 1946, pp. 401–421. Statistical data as of Dec. 31, 1941, on survival and retirement of cast-iron unlined mains, cement mains, galvanized iron mains, steel mains, disk meters, compound meters, and turbine meters; charts; tables.

WATER TANKS AND TOWERS. Escanaba's Overhead Water Storage Tank Cuts Pumping Cost. *Am. City*, vol. 61, no. 2, Feb. 1946, p. 90. Brief note on new water storage tank with a capacity of half a million gallons, serving population of 15,000 in Escanaba, Mich.; tank is of radial cone bottom and ellipsoidal roof type, supported on eight 110-ft cylindrical columns.

WATER TANKS AND TOWERS. Peacetime Tank Maneuvers. *Eng. News-Rec.* (News Issue), vol. 136, no. 3, Jan. 17, 1946, p. 89. Brief note on two water-tank moving jobs recently performed without necessity of dismantling supporting structure; 800-ft shift of tank of over 91-ft height; 40-ft jacking-up job of tank over 145 ft high.

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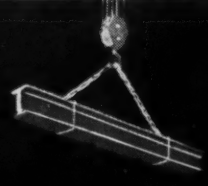

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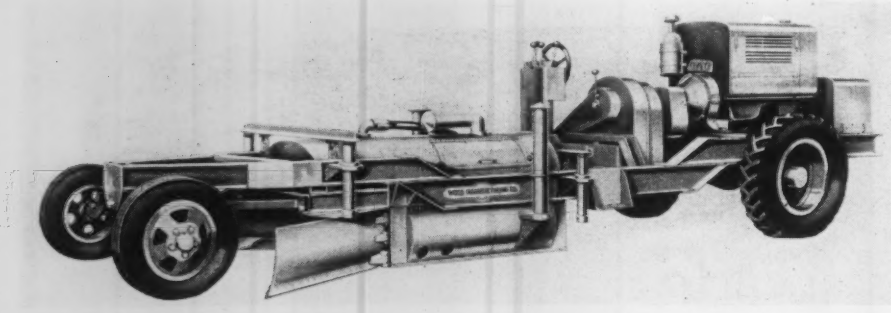
New Developments of Interest, as Reported by Manufacturers

New Traveling Mixing Plant

WOOD MANUFACTURING COMPANY, Box 620, Tujunga Ave., North Hollywood, Calif., announces the addition of the Wood Roadmixer Model 36 to their line of road-building equipment. The new low cost, one-man operated Model 36 is self-propelled, pneumatic tire-mounted traveling mixing plant, designed for maneuverability, speed, and capacity. It is ideal for small operations and yet has sufficient capacity for large jobs. It handles soil cement, tar, cut-back asphalts, and emulsified asphalts, making a thorough mix in one pass. This machine handles up to 4 cu ft windrows, and produces from 100 to 150 tons of ready-to-spread mix per hour.



One of the outstanding features of the Wood Roadmixer Model 36 is its extreme maneuverability in some areas. The machine is handled as easily as a motor patrol with a range of 5 speeds from 2 to 14 miles per hr, forward or reverse. Being full rubber mounted, it does not damage existing pavements, yet it has sufficient traction for all normal operating conditions. On the job, these speeds are available forward and reverse for quick maneuvering in confined areas. This eliminates the need for turning on the job and the machine is simply backed up to the start of a new windrow. For mixing, the Model 36 also has five speeds, ranging from 11.5 to 71 ft per min.

All of the proved features of the Wood Roadmixer Models 48 and 54 are incorporated in the new Model 36. The hydraulic-power lift on the mixing drum raises the drum a full 12 in., giving ample clearance for maneuvering over unmixed windrows. Steering is accomplished by hydraulic power. As used on the larger Wood Roadmixers, the burner system is of the compressed air, fuel oil type; the liquid binder is controlled by a by-pass valve; with meter, gage and thermometer within full view of the operator.

Only one man is required to operate the Model 36 Wood Roadmixer. He easily controls the entire unit from his operator's station, has clear visibility of work and gages, and quick access to all controls. The entire operating procedure is so simplified that any competent workman can operate a Wood Roadmixer Model 36.

Builders on West Coast

Builders Iron Foundry of Providence R.I., announces the formation of a new affiliate, "Builders-Pacific, Inc.," a California corporation with offices, warehousing and service facilities in San Francisco and Los Angeles. The main office of Builders-Pacific is located at 921 University Ave., Berkeley, and the Los Angeles office at 2085 Belgrave Ave., Huntington Park.

Builders-Pacific will represent three affiliates of Builders Iron Foundry: Builders-Providence, Inc., The Omega Machine Co., and (in Northern California) %Proportioneers, Inc.%, and will also represent the Walker Process Equipment Inc., of Aurora, Ill., the Aurora Pump Co., and The Ludlow Valve Mfg. Co., of Troy, N.Y.

Safety Steel Climbers

Austin Supply Company, 3627 N. 20th St., Philadelphia 40, Pa., announces new light-weight steel climbers of positive safety design for use on verticle "H" or "I" beams. Strapped over workers' shoes, the design is such that the hard-rubber gripping spurs give full 3-in. purchase on each side of the beam and will not mar painted surfaces. When the wearer leans back, resting his weight on the climbers, they are said to grip the beam section firmly with no possible chance of slippage, even on wet surfaces. Both ball and heel of the foot are firmly supported; the worker is relaxed. Walk-up Safety Climbers are reported in use by public utilities, railroads, shipyards, riggers, painters, steel erectors, and plant maintenance departments.

Industrial Compressors

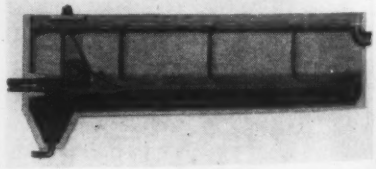
A new line of industrial "Departmental" compressors was announced recently by Davey Compressor Co., Kent, Ohio. These new units are available in 60, 105, 160, 210, 315 c.f.m. sizes. They are designed for installation in individual plant departments and are offered as modern, economical replacements for large central compressor systems.

The Departmental System, a completely new plan for industrial air compressor installations, is a progressive departure from the conventional central system where a large compressor pipes air to various departments. Under the departmental system, for example, if 6 departments require compressed air, 6 separate compressors of proper capacities are installed. Each operates independently but several units are connected together to provide a power reserve for overpeak loads, or maintain service in case of breakdowns. Further details and descriptions from the manufacturer.

Vertical Flow Thickener

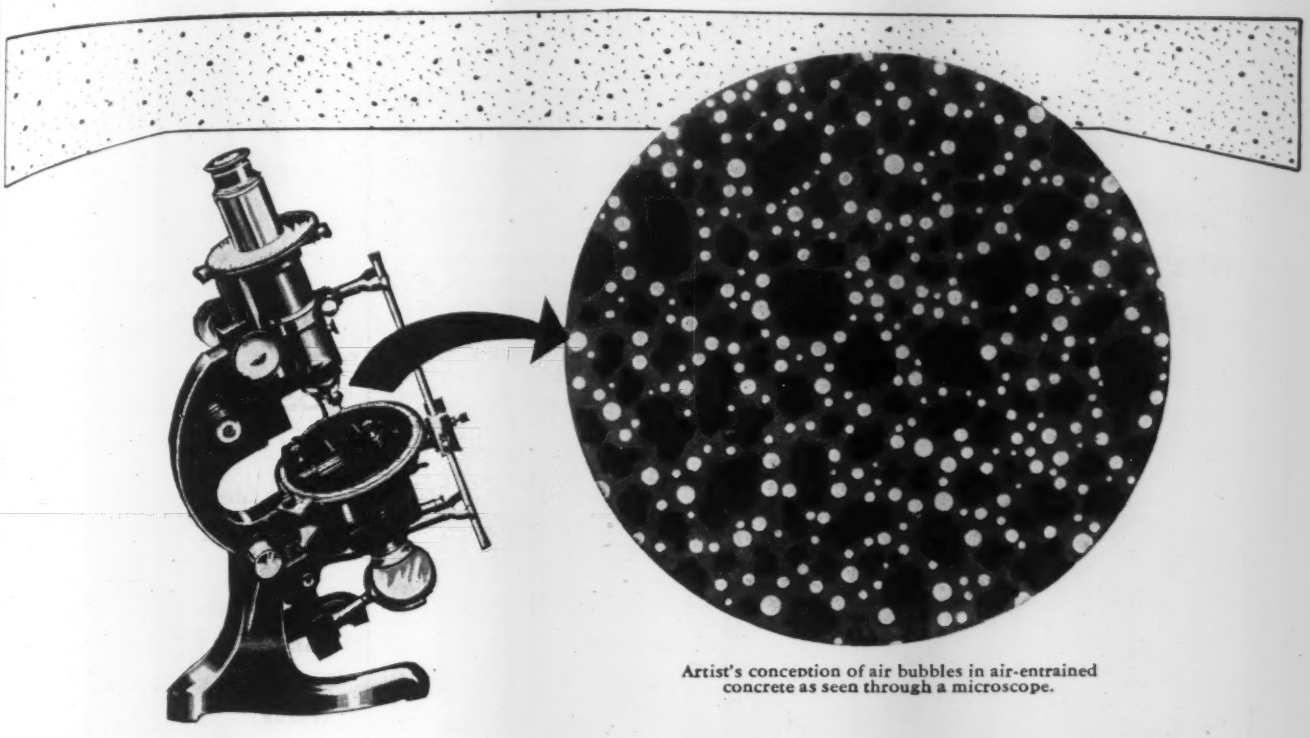
CHAIN BELT COMPANY, Milwaukee 4, Wis., is manufacturing a new vertical flow, slurry blanket type of thickener known as the Rex Verti-Flo Thickener. This new unit is said to be particularly effective in delivering highly clarified effluents with relatively low detention periods when handling certain types of solids.

The Rex Verti-Flo Thickener employs a unique, cellular construction obtained by dividing a conventional sedimentation basin with proper weirs and baffles. Extremely long weir length is obtained with this design. The adjustable weirs allow close regulation of flow distribution among the cells.



Rex Conveyor Sludge Collectors are installed on the tank to concentrate the sludge at the influent end of the tank and maintain a fluid sludge blanket in the zone of flow immediately below the baffles. Continuous operation of the conveyor sludge remover provides a constant recirculation of sludge to the influent end of the basin.

Superior results are claimed for this unit due to the straining or filtering of fine solids by the slurry blanket. . .also to the low, vertical velocities and the large weir length provided by this design.



Artist's conception of air bubbles in air-entrained concrete as seen through a microscope.

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is the answer of research to the problem of concrete pavement scaling.

The repeated use of concentrated calcium chloride and common salt to melt ice and snow on main traveled highways and streets, (a relatively new and largely wartime expedient), has caused unsightly scaling of well-constructed concrete pavements. Impaired riding qualities and increased maintenance have often resulted.

To conserve the public's investment in *existing concrete* pavements, the *careless* use of such concentrated chemicals should be avoided. If chloride salts are to be used for ice control, the pavements should receive a protective treatment *developed by research* and the chemicals should be used *intelligently and sparingly.*

For *future pavements,* the protection should be *built in the concrete* by using

AIR-ENTRAINING PORTLAND CEMENT

Send for bulletins, "Elimination of Pavement Scaling by Use of Air-Entraining Portland Cement," and "Protection of Existing Concrete Pavements from Salt and Calcium Chloride." Free in United States and Canada.

PORTLAND CEMENT ASSOCIATION

Dept. 9-13, 33 W. Grand Ave., Chicago 10, Ill.

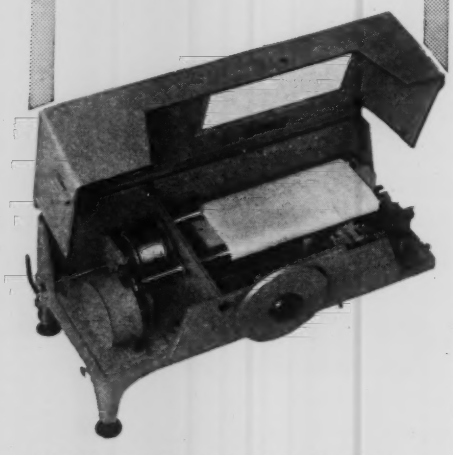
A national organization to improve and extend the uses of concrete ...through scientific research and engineering field work

Air-entraining portland cement was used in the 10-in. concrete slab on the Davison Limited Access Highway in Detroit

L&S

STEVENS WATER LEVEL RECORDER

Type A35



FIRST developed in 1911, the Stevens *Type A* Recorder is used the world over. Fundamental principles of the instrument are the use of a continuous chart and an unlimited range of stages.

The *Type A35* consists essentially of a height element mechanism to register elevation of water surface above a chosen datum to a convenient scale, plus a time element mechanism to move a chart at a conveniently uniform speed. Visible graph strip charts 10″ or 20″ wide (also corresponding metric charts) . . . Weight-driven clock (synchronous electric clocks available on order) . . . Non-corrodible metal used throughout . . . One-piece protective hinged cover . . . The *Type A35* is adaptable to remote registration. Write for Bulletin No. 12.

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Please send Bulletin No. 12 on the Stevens *Type* A35 Recorder.

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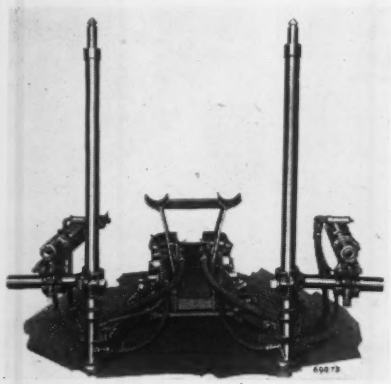
Air-Operated Drill Jumbo

INGERSOLL-RAND CO., 11 Broadway, New York 4, N.Y., announces a new air-operated drill-jumbo mounting for easier, safer work and faster setups than are accomplished by hand methods. Installed permanently on a mine car the resulting unit does the work, not only of setting up but of transporting the drifters, drill steel, hose and accessories to the heading. On arrival at the face, the miners have only to swing the air columns into a vertical position, then turn on the air which pushes the column pistons firmly against the roof. No blocking is needed and the drills are ready to operate.



Little effort is required to move the arms and drifters up or down the column with the hand cranks provided. The entire unit is rigid since a force of 600 lb holds the column and car solidly in place. Roof jacks are thus eliminated. A new bulletin, Form 4034, contains a full description of this air-operated drill-jumbo mounting.

Hydraulic Computations

A slide rule and correction factor curves is the medium for direct mechanical solution of such factors as water depth, slope, width of channel, discharge quantity, and coefficient of roughness as defined by the Manning or Kutter formulas, the manufacturer states. Velocity of flow is also obtainable.

The slide rule is based on an adaptation of the Manning formula. The water depth factor has been substituted for the hydraulic radius. When the ratio of the width of the channel to the depth of water is larger than about fifty there is no necessity for correction. Ratios under fifty are readily corrected by means of the accompanying graphs or correction curves. These curves have been adjusted so that a direct multiplication or division of the factor by the slide rule result gives the desired answer.

This method of procedure is claimed to be direct and to avoid much laborious interpolation. The booklet and the slide rule, which sell for $3.00, help to solve a wide range of problems: from the flow in very wide and deep river channels to the farmer's irrigation ditch. Charles Harry Monett, 300 South Carmelina Ave., Los Angeles 24, Calif.

M H

HYDRANTS & VALVES

Pipe Line Accessories for Water Works and Sewage Works

VALVES: A.W.W.A. type iron body, bronze mounted with double-disc parallel seat or solid wedge type. Non-rising stem, outside screw and yoke, or with sliding stem and lever. Also furnished hydraulically operated. Square bottom type operates in any position. All rugged and dependable, made of best material with highest quality workmanship.

HYDRANTS: Standard A.W.W.A. type approved by Underwriters and Factory Mutuals. Dry top, revolving head, easy to lubricate. High efficiency because barrel diameter not reduced and there are no working parts or obstructions in waterway. SPECIAL TRAFFIC MODEL is designed to yield at ground line under impact, repair being simply renewal of breakable bolts and breakable coupling on stem.

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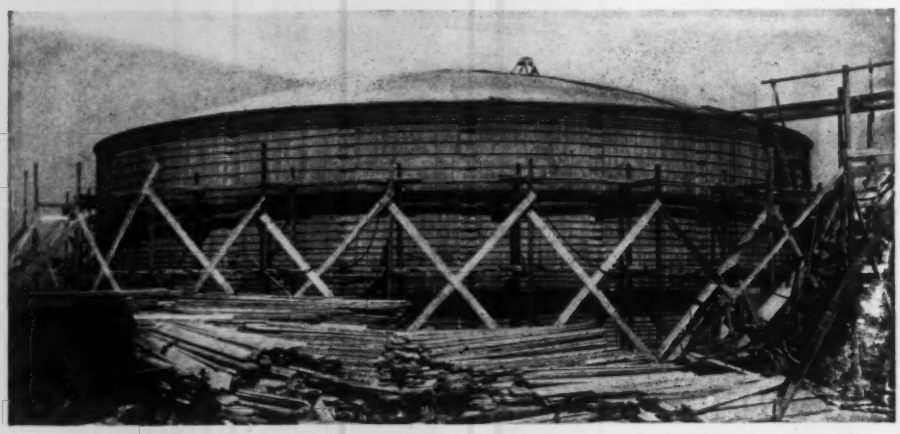

• PRE-STRESSED "GUNITE" TANK •

The partly completed "GUNITE" water storage tank pictured above illustrates modern pre-stressed tank design.

Around the outside of the "GUNITE" wall hoop rods are placed and the segments of these rings are coupled with turnbuckles. Tightening the hoops by means of the turnbuckles to a pre-determined stress produces compression in the "GUNITE" wall. This pre-stressing is designed to maintain the "GUNITE" in some compression when the tank is full of water, thus preventing elongation of the wall with resultant cracks and leakage.

After the hoops are pre-stressed and the tank tested a covering of mesh reinforced "GUNITE" is placed over the exterior to permanently protect the hoop steel.

The tank illustrated also includes a "GUNITE" domed roof, the ring girder of which is similarly pre-stressed.

Pre-stressed "GUNITE" tanks are bottle tight and maintenance free. We have built scores of such tanks with capacities ranging from 25 thousand to 2 1/2 million gallons. This type of work is completely described and illustrated in our bulletin A2300.

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Rex Return Idler

A new belt conveyor idler, known as the Rex Roller-Bearing Style No. 55RC Rubber Covered Spiral Return Idler, was designed to combat many of the common faults frequently experienced when ordinary type of return idlers are used under extreme conditions where freezing and ice formation on the rolls or where high abrasive wear on the roll is a problem. Since the carrying side of the conveyor belt directly contacts the face of the return idler, the return roll is subjected to the action of material adhering to the belt surface.

The Rex Rubber Covered Spiral Return Idler is built of a flat-bar steel helical spiral, covered with rubber. This spiral is mounted on a standard assembly. The steel spiral is accurately machined-formed and permanently welded to the bearing tube. The spiral itself is composed of right and left-hand sections to insure centering the belt. The rubber used as the spiral covering is specially extruded and is simply opened up and snapped over the bar. In addition, each end is securely clamped. Replacement of the rubber is a simple matter. Each end of the roll is equipped for high-pressure grease lubrication, and is regularly furnished with hydraulic type fitting.

Under normal conditions, it is sufficient to use several units immediately following the head pulley—only enough to cover the distance that is required for the belt to free itself of material clinging to it. Under particularly severe conditions, it may be advisable to completely equip the return run with the type of Idler.

For further details on the Rex Roller-Bearing Style No. 55RC Rubber Covered Return Idler, write Chain Belt Company, 1600 W. Bruce St., Milwaukee, 4, Wis.

Power Unit

The "Power-Package," a new product for industry, is now rolling off the production line at Salsbury Motors, Inc., Pomona, Calif., a wholly owned subsidiary of Northrop Aircraft, Inc. The Power-Package consists of a 6-hp gasoline engine, with automatic clutch, and automatic transmission, designed to transmit the engine's power smoothly and at the most advantageous speed, depending on load.

The Salsbury Power Package will power light vehicles, or fit almost any stationary use in which a small engine is required to transmit power gradually and at varying speeds.

All three elements of the Power-Package —engine, clutch, transmission—are of Salsbury design and manufacture. The engine weighs 56 lb, and develops 6½ hp at 3200 revolutions per minute. The clutch and transmission have very few operating parts. The clutch, engaged by centrifugal force, applies the power smoothly and eliminates starting shocks. The transmission, in which centrifugal force also serves to change the gear ratio over an infinitely variable range of speeds, is entirely automatic. It "gears down" the engine for moving heavy loads, "speeds up" the ratio to do lighter work faster.

With all its other advantages

CONCRETE CONSTRUCTION *COSTS LESS*

This large hospital at Sylacauga, Ala., is built of architectural concrete. Architect was Charles H. McCauley, A. I. A. of Birmingham. General contractor, Algernon Blair of Montgomery.

Architectural concrete walls with reinforced concrete frame and floors for hospitals, apartment houses and other large buildings enable designers to stay within limited budgets and still provide attractive, firesafe, enduring buildings maintained at low cost.

Comparative cost analyses on jobs actually built show that reinforced concrete frame construction, including columns, floors and ceiling treatment, costs from 27 to 40 per cent less per square foot of floor area, than alternate types of construction.

Other comparative cost studies on walls of 16 widely separated projects show savings of from 16 to 27 per cent of the wall cost through the use of architectural concrete. Seventy-six per cent of contractors submitting proposals on these jobs bid less on concrete than for alternate types of construction.

Our free booklets, *"Continuity in Concrete Building Frames,"* or *"Forms for Architectural Concrete,"* will interest architects and engineers planning hospitals, apartment buildings, schools or industrial plants. They are distributed only in the United States and Canada. See Sweets Catalog 4e/6.

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POST

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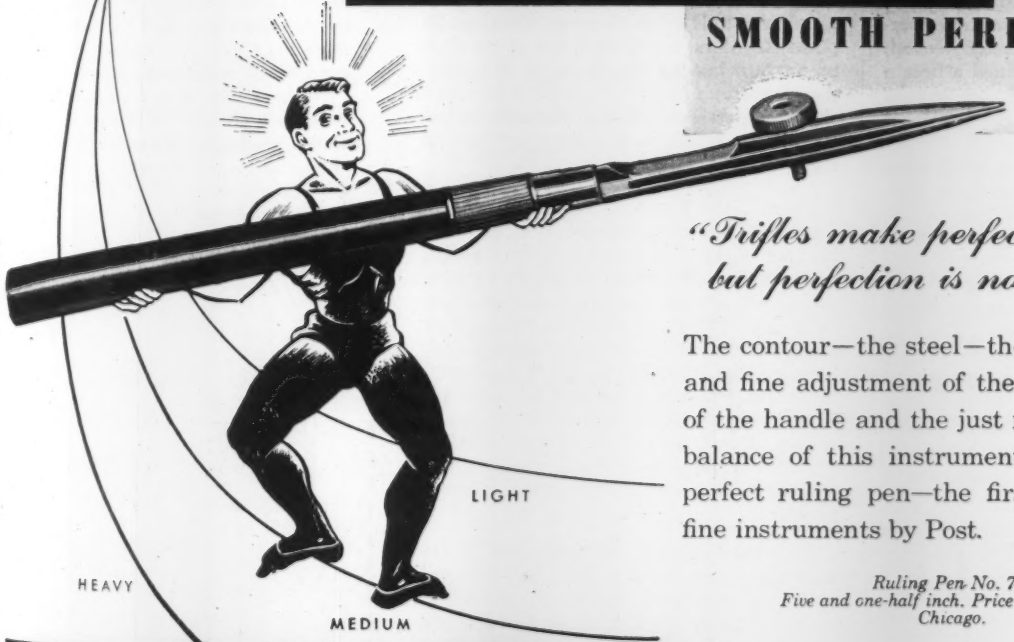

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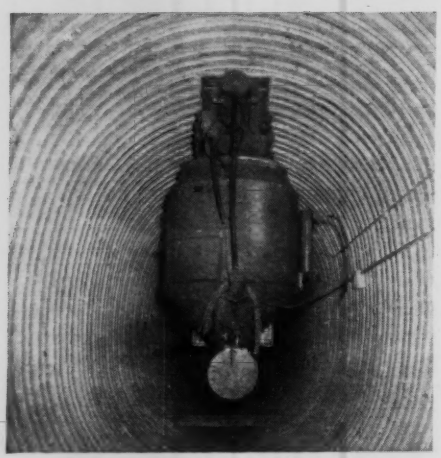

Rear view of weighing hopper. This elliptical batching tunnel of No. 10 gage Armco Steel is 11 by 13 feet and 460 feet long. Raw aggregates were stored over a 10-foot tunnel, 260 feet long, and wet sand over an 8-foot tunnel, 190 feet long.

This is how three aggregate tunnels built of ARMCO Corrugated Liner Plates helped speed construction of the Norfork Dam—a 1,500,000 cubic yard job.

First, the plates were easy to handle and install. Then, their designed strength permitted placing the tunnel directly beneath the aggregate pile, which attained a height of 60 feet. Delays caused by freezing in cold weather were avoided because the aggregate was handled from the bottom.

Armco's method of bolted construction made it a simple matter to locate the hoppers at any desired point. When the job was done the ARMCO Liner Plates were removed, nested together and stored in a minimum of space for future use.

There is a type and gage of Armco Plates to meet every tunnel condition. You can order exactly what you need for the job and the chances are you'll be "holing through" ahead of schedule. Write today for information on your specific needs. Armco Drainage & Metal Products, Inc., and Associated Companies, 1365 Curtis St., Middletown, O

ARMCO

Tunnel Liner Plates

Literature Available

CLAMSHELL BUCKETS—Advantages of all-welded construction in clamshell buckets are analyzed in a new 8-page booklet in color by C. S. Johnson Co., Koehring subsidiary, Champaign, Ill. Complete specifications for all three types of the Johnson All-Welded Clamshell Bucket—General Purpose, Wide-Rehandling and Heavy-Duty Digging—in sizes from $^3/_8$ yd to $2^1/_2$ yd, are included in the booklet.

DWARF ORANGE PEEL BUCKET—Designed for operation inside a 12-in. diameter pipe and for digging wells, catch basins and small drainage ditches, the improved Hayward Dwarf Orange Peel Bucket makes possible significant economies in removing all kinds of materials such as broken stone, boulders, old timber, metals, and other substances found in "filled-in" ground. Full details are given in a new Hayward Bulletin, No. 804, that has just been published by the manufacturers, The Hayward Company, 50 Church St., New York 7, N.Y.

EARTHMOVING—R. G. LeTourneau, Inc., Peoria, Ill., has prepared a 12-page folder of actual job records to acquaint equipment owners and operators with the many possible applications of Tournapulls to earthmoving and construction work. Actual job experience of eight major contractors on 25 completed projects have been assembled for study and comparison. Each job is illustrated with action photographs.

FINANCING EQUIPMENT PURCHASES—The service which the C.I.T. Corporation offers to contractors in the financing of equipment purchases is concisely described in the pocket-size folder. C.I.T. Corp., 1 Park Ave., New York 16, N.Y.

HOISTS AND DERRICKS—The new American Hoist & Derrick General Catalog, 28 pages, 2 colors, is the first one of its kind in announcing all the lines of the company's manufacture. It covers blocks and sheaves, derricks, cranes, material elevators, hoists ditchers, and six other lines of equipment.

LOCK NUT TESTS—"Test Procedure," a 16-page booklet describing in comprehensive fashion a procedure for testing and locking effectiveness of self-locking nuts and related fastening devices, has been published by Elastic Stop Nut Corporation of America, Union, N.J. This booklet describes in detail the equipment and procedure for making tests for vibration, installation and removal torque, re-use torque, and wearing and plating. It also explains how to evaluate these tests in connection with individual fastener problems.

MOTORS—Slip Ring Induction Polyphase Motors from 1 to 350 hp are covered in an 8-page folder. Operating characteristics, and Century illustrations of stators, rotors, and bearings with complete illustrations and descriptions of all the motors and their mechanical forms are included. The Century Electric Company, 1806 Pine St., St. Louis 3, Mo.

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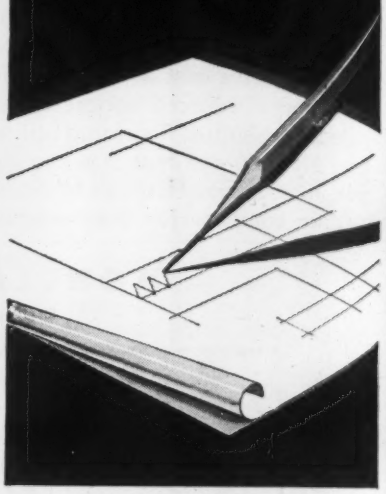

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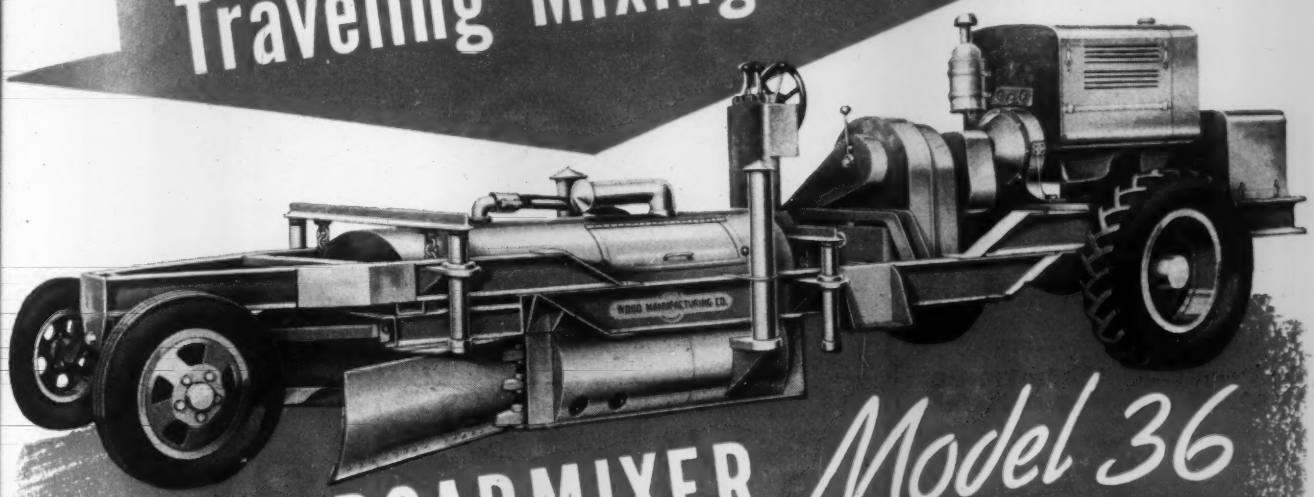

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1-36

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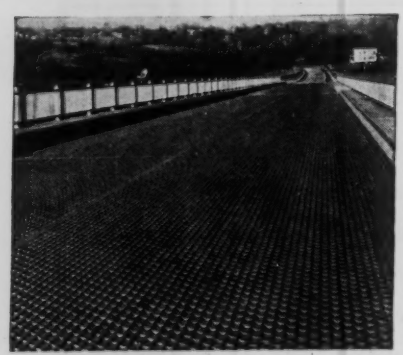

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MOTOR GRADER—A 32-page catalog No. MS-300A featuring the newly improved AD motor grader, stresses the capacity, performance, and design, giving special attention to clearance, blade construction and range, electric brakes, sturdy frame and its General Motors 2-cycle, 75-hp engine. A specification sheet lists data concerning weights, its six forward speeds from 1.5 to 16.6 m.p.h., lifting mechanisms, tire sizes, fuel capacities, and engine dimensions. Allis-Chalmers Mfg. Co., Tractor Division, Milwaukee 1, Wis.

RAIL CROPPING MACHINE—A six-page, illustrated folder describes the new Air Reduction rail cropping machine. Operating instructions are included as well as repair and replacement parts lists for the rail cropping machine and the two torches with which it is equipped. The folder explains how Airco's new machine simplifies the process of cropping relay rails. Air Reduction Sales Co., 60 East 42d St., New York 17, N.Y.

REACTIVATOR—A complete description and operating explanation of the Graver Sludge Blanket Type Reactivator is contained in their new eight-page booklet. Charts, flow diagrams, and cut-away drawings show clearly how this equipment can soften and clarify raw water, materially reduce reaction time, and provide a treated water that, in many cases, is suitable for process use without further treatment. Graver Tank & Mfg. Co., Inc., 332 South Michigan Ave., Chicago, Ill.

SHEET PILING—A new catalog by the Caine Steel Co., 1820 N. Central Ave., Chicago 39, Ill., describes Caine Corr-Plate Steel Piling for sewer work, bulkheads, retaining walls, dams, shore and flood protection and soil erosion projects. Diagrams, tables, dimensions, and weights make it easy to figure the requirements of any piling job, select the amount needed, and estimate the cost.

TESTING—The Pittsburgh Testing Laboratories, Pittsburgh, Pa., has published a new brochure interpreting and illustrating the three major phases of its extensive facilities and organization. The brochure discusses in detail PTL's independent fact-finding functions. One of these services is the testing of materials, which includes research into the nature of substances as well as routine physical and chemical analyses of all kinds. Another PTL function is field inspection and testing, including the checking of quality, quantity, and specifications of materials for those buying from outside sources. This service also includes the inspection of buildings, engineering projects, and materials during construction. The third PTL service is product performance testing.

TRAILERS—Athey Products Corporation's new PD-10 rubber-tired trailer, the companion unit for "Caterpillar's" DW-10 tractor, is described in Form No. 448, a broadside, which tells the complete story of the new Athey Trailer, and is illustrated with photographs and diagrams showing design features, applications, and specifications. Athey Products Corporation, 5631 West 65th St., Chicago 38, Ill.

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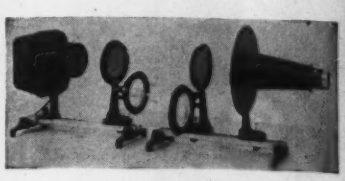

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Literature of new model polariscope now available

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